

# Renewable Natural Resources in Alberta

*Supplement to Biology 20*



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# Renewable Natural Resources in Alberta

*Supplement to Biology 20*

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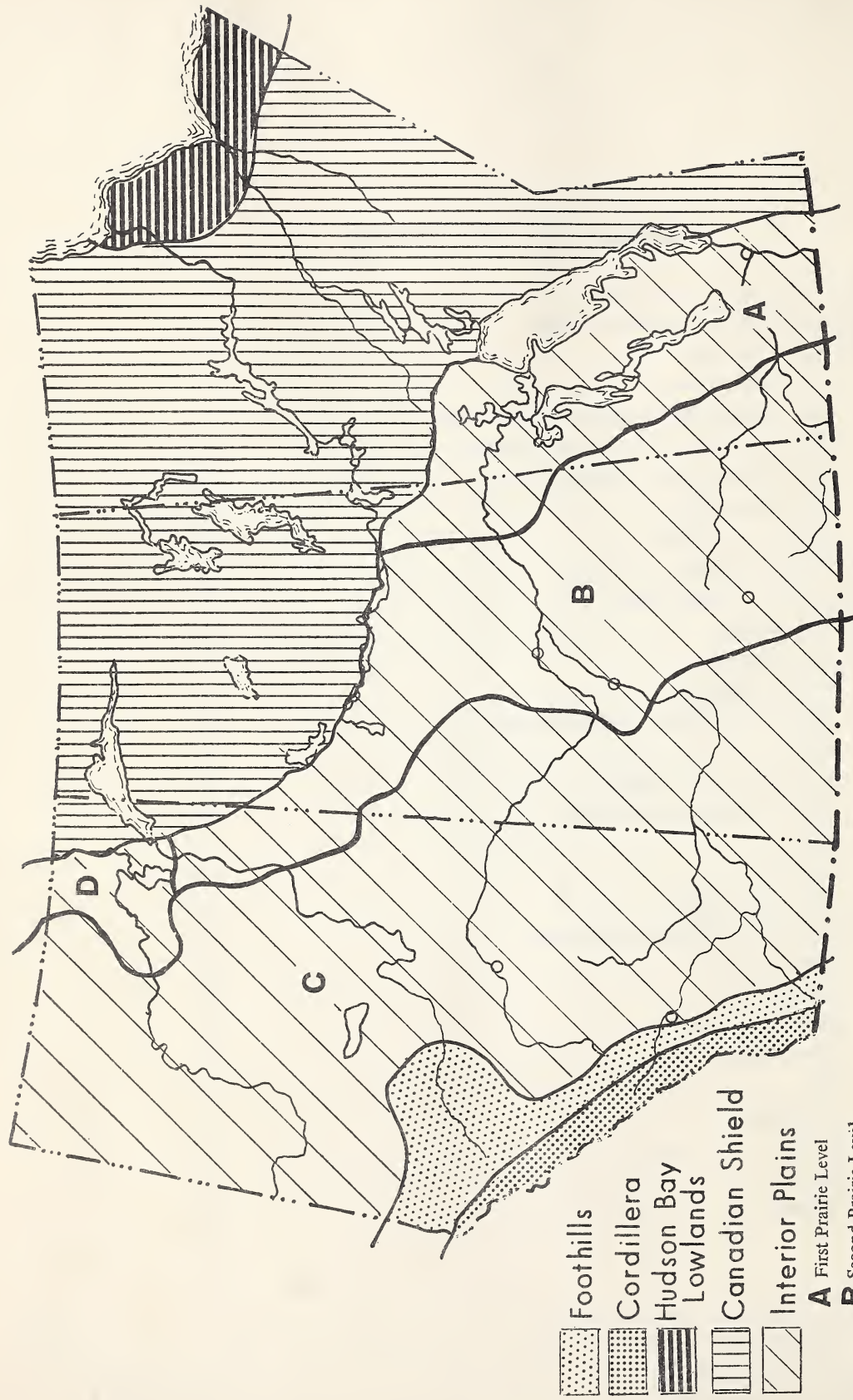
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PRAIRIE PROVINCES  
**PHYSIOGRAPHIC REGIONS**

FIG. 1

# RENEWABLE NATURAL RESOURCES IN ALBERTA

## The Nature of the Environment

Nothing is more important to a country than its natural resources. These resources include minerals, coal, oil, forests, farming areas, wildlife and, most important, its people. Of the natural resources, we can distinguish those which are renewable from those which cannot be replaced when once used. The latter are minerals and fossil fuels, things taken from the ground and irretrievably changed from their original nature. These things we must use with great care, for when they are gone we must do without. The renewable natural resources, on the other hand, are the living things, plant and animal, which reproduce themselves to provide an abundance forever. But these resources must be handled with care, for if misused or overused they too can disappear, never to reappear.

Many, many kinds of plants and animals have become extinct, and more are disappearing every day. Most wild plants and animals cannot survive the civilizing influences of man. Here the trained biologist can be of use. He is able to go into wilderness areas to study plants and animals in their natural state to discover the requirements of these organisms. Then the biologist can return to tell us what we should do so that the wild things and man can continue to live together. The biologist can tell us how much hunting or fishing, or building or agriculture can be undertaken so that plants and animals will still survive to renew themselves for generations of men after us. If we want to continue to be able to see moose or eagles or cougars, or the flowers of paintbrush or shooting star, we must be prepared to treat them as natural resources under the advice of our biologists, whose rules and regulations are designed to try to allow plants and animals to survive to give the most benefit to the most people. This process is very like that of agriculture. The good farmer does not grow wheat until the soil gives out, then move on. He regulates the amount of wheat he grows; he rotates crops; he treats the soil; in short, he makes sure his natural resource is renewable. And so should we try to utilize the bounty of nature, so that it is always with us and is not shot out or burnt out or built out.

How do we go about understanding and using wisely our wild renewable resources? There are many things to do, all of which relate to the fact that the presence of given plants and animals in an area depends upon the nature of the environment. This in turn depends largely on geographic location. One must take into account latitude, altitude, geology, climate and so on. Here in Alberta we are in the midst of a great continent far from the sea, in the rain shadow of high mountains. These are the conditions that determine what will grow and live here.

Let us examine a series of maps to see what factors govern conditions in the prairie provinces. Examine the illustrations that follow; be sure you can identify the geographic features shown.

Fig. 1 is a physiographic map. It shows the major features of the land in the Prairie Provinces. The greatest part of this region lies in the central interior plain of North America. To the west are the mountains, the Cordillera. To the east lie more mountains, ancient and highly eroded so all that is left is the low rocky mass of the Canadian Shield. The interior plain is not an entirely flat area; four distinct levels are apparent in the prairie provinces. Most of Alberta lies on the high plains. The prairies descend in two levels to the east across Saskatchewan and Manitoba. The Mackenzie lowlands descend to the north. Notice how the main rivers follow these conformations.

The regions we have been discussing are overlain by a variety of soils. Their nature depends upon the geology, the climate and the effects of the last Ice Age. Some ten to twenty thousand years ago a gigantic glacier centred in the Keewatin area of the North West Territories covered much of North America. All of Manitoba and Saskatchewan and most of Alberta were covered by ice from this centre. The ice deposited rocks and sand, gouged out lake basins and left piles of debris scattered across the land. As the glacier retreated, large lakes were left at its margin. The lake deposits often form the rich flat farmlands of today.

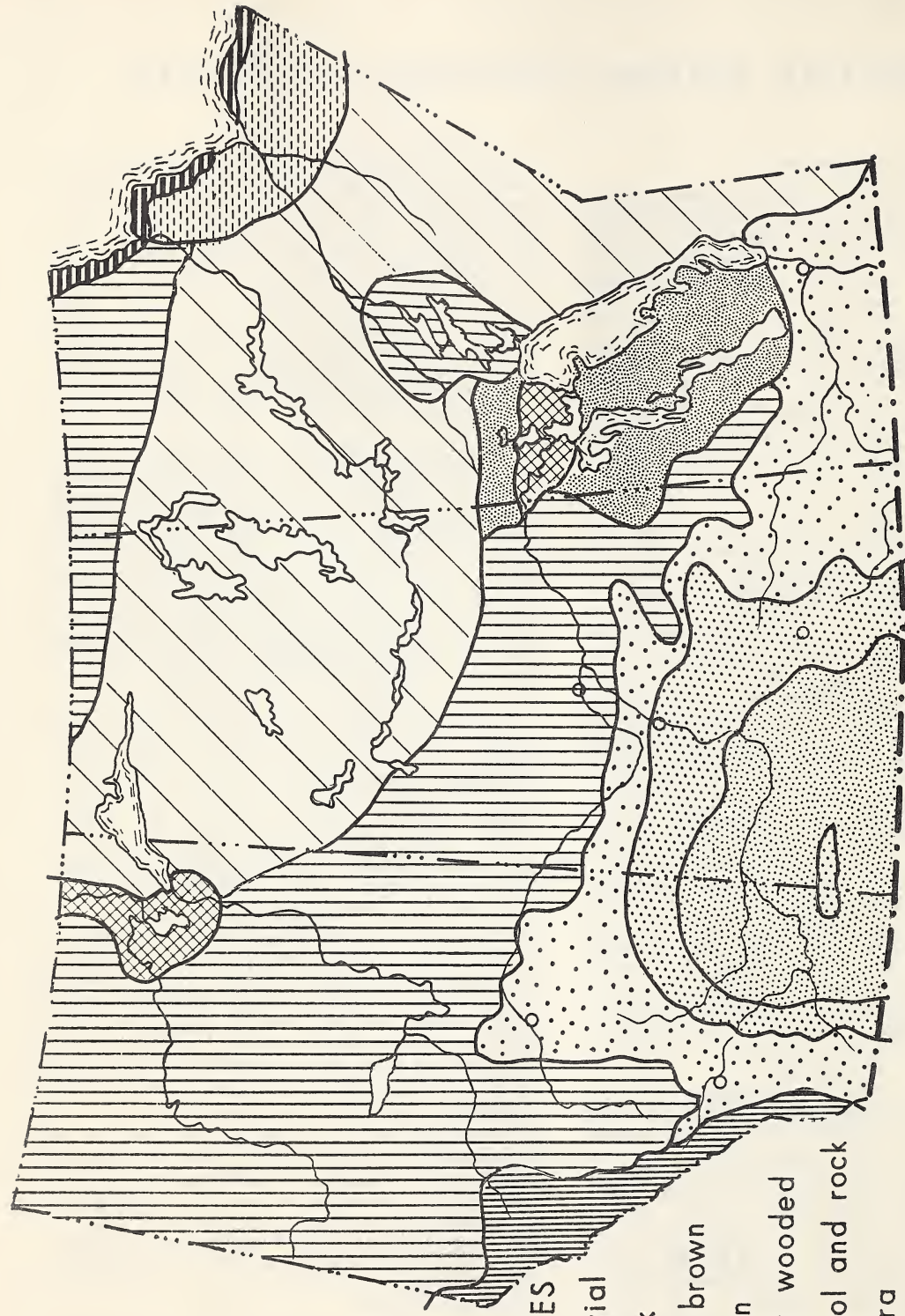
Soils and climate and vegetation all affect one another. Fig. 2 shows the major soil types of the prairies. The interior plain is most useful agriculturally in the dark brown and black soil zones. The Canadian Shield is largely rocky, with grey, acidic soil called podzol, with less acidic grey wooded soil occurring to the north in Manitoba and Saskatchewan. Alluvial soils represent deposits from major waterways. The high lime soils of Manitoba show where salts were concentrated as a great glacial lake dried up.

See in Fig. 3 how the climatic regions of the prairies tend to resemble the soil zones. The semiarid mid-latitude steppe in southeastern Alberta and southwestern Saskatchewan produces brown soil with little organic matter and no leaching (washing away of soil nutrients) by rainfall. The continental climate zone, with more rainfall, helps change the nature of the soil and we find there the dark browns, blacks and greys. The subarctic zone generally has grey soil.

Even more closely mirroring the soil zones are the vegetation zones, shown in Fig. 4. Compare Figs. 2, 3 and 4 to see similarities in distribution. Not only do soils influence vegetation, but the type of vegetational cover will markedly influence the nature of a soil by providing organic matter and interfering with leaching. Learn the approximate distributions of the vegetation zones in Alberta; they will be referred to often in the discussion to follow.

One further environmental factor, of great importance, related to those already discussed, is shown in Fig. 5. The lines on the map represent the margins of regions which are distinguished by the length of their





# SOIL TYPES

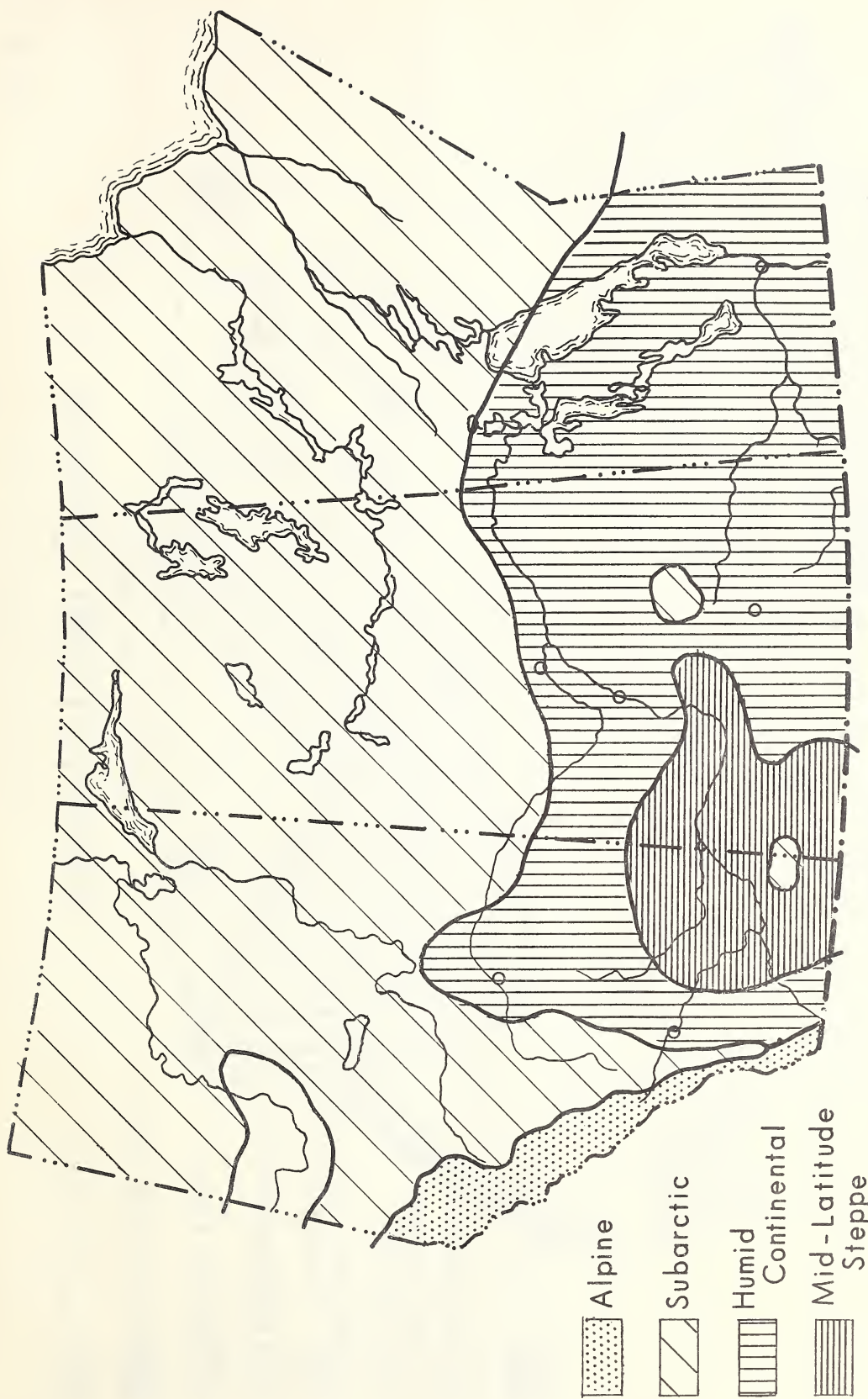
- Alluvial
- Black
- Dark brown
- Brown
- Grey wooded
- Podzol and rock
- Tundra
- High lime
- Mountain
- Subarctic and peat

## PRAIRIE PROVINCES

## SOILS

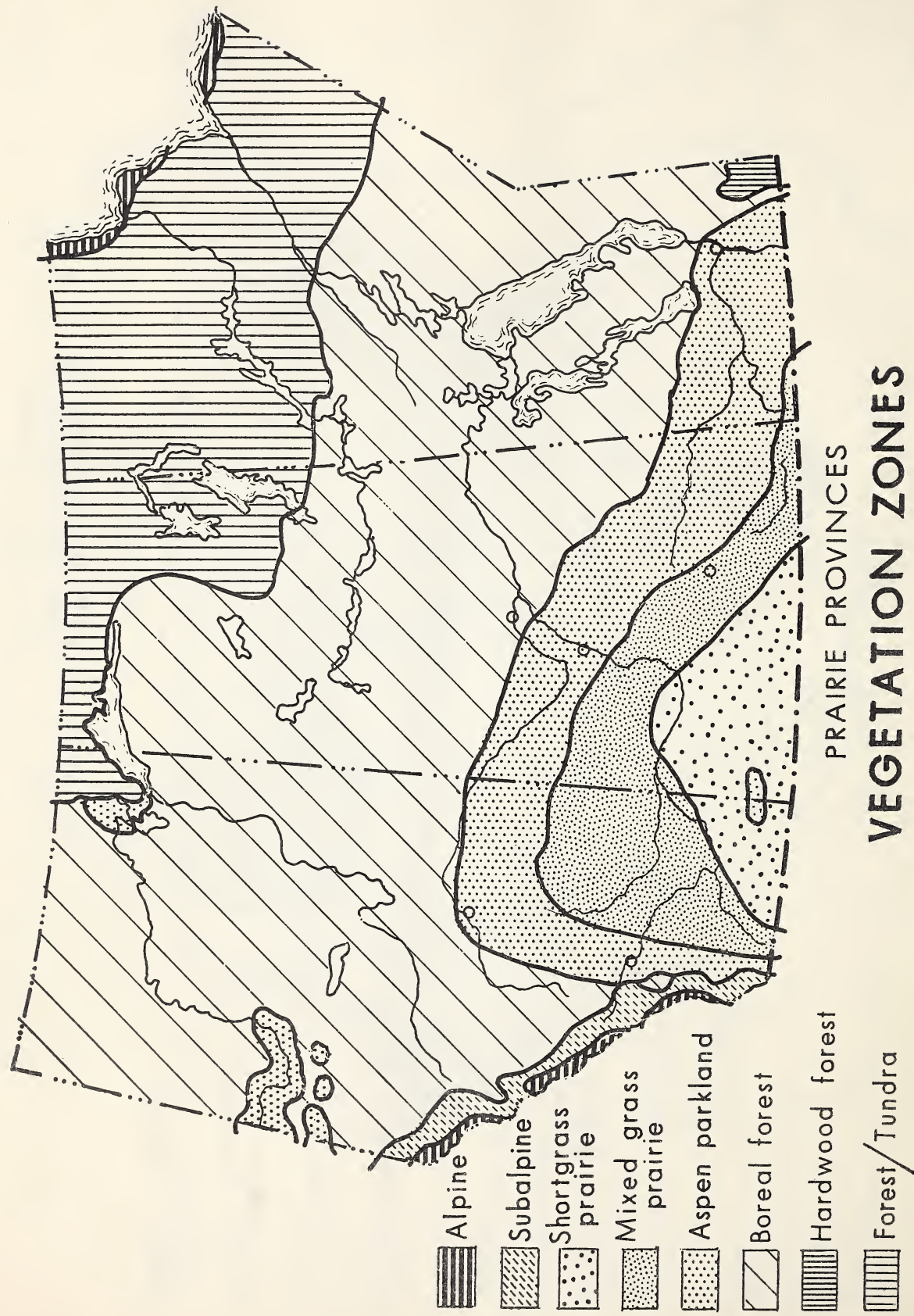
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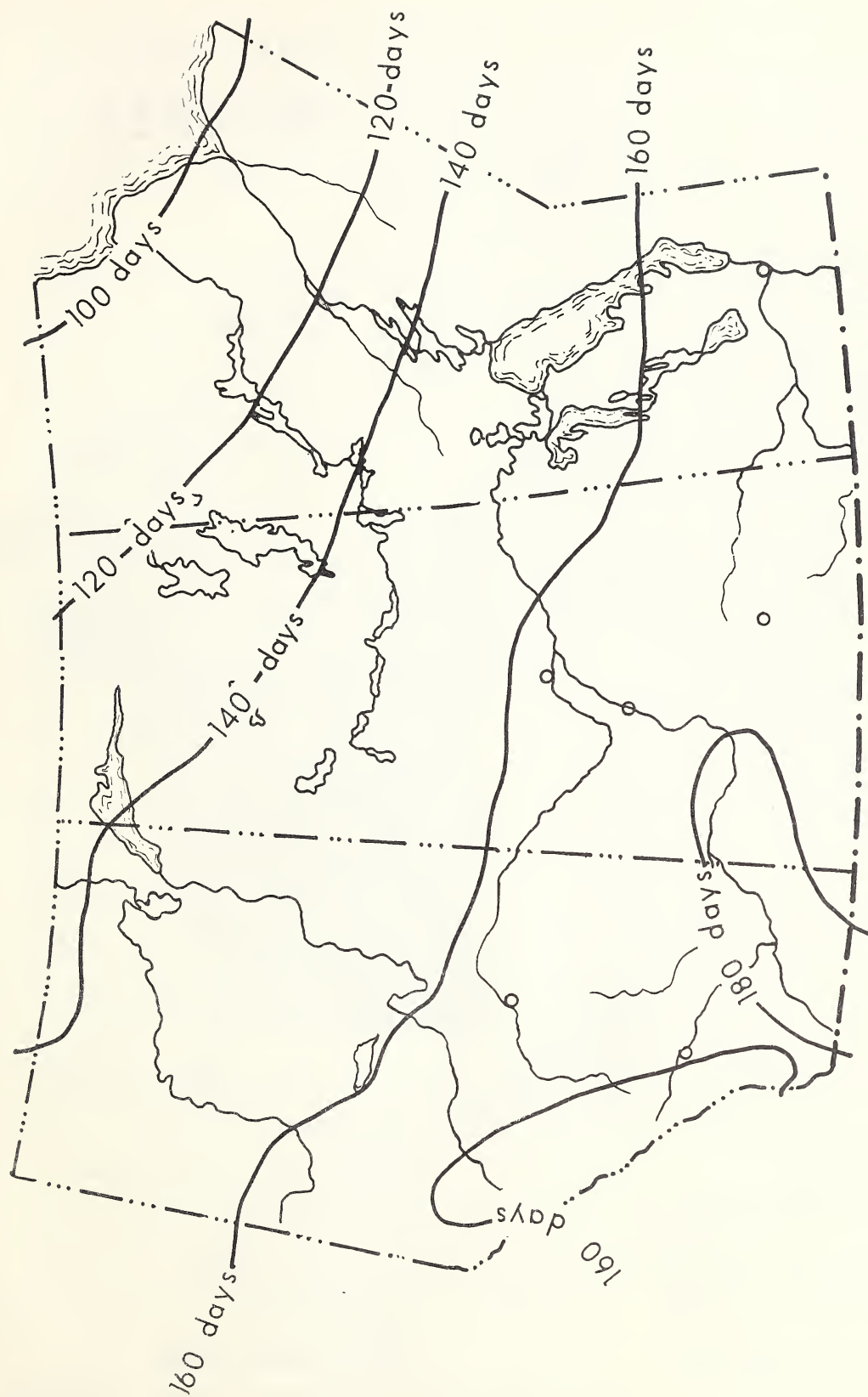
FIG. 2



PRAIRIE PROVINCES  
CLIMATIC REGIONS







PRAIRIE PROVINCES

# MEAN ANNUAL LENGTH OF GROWING SEASON

0 100 200 300 MILES

# NORTH AMERICA BIOMES

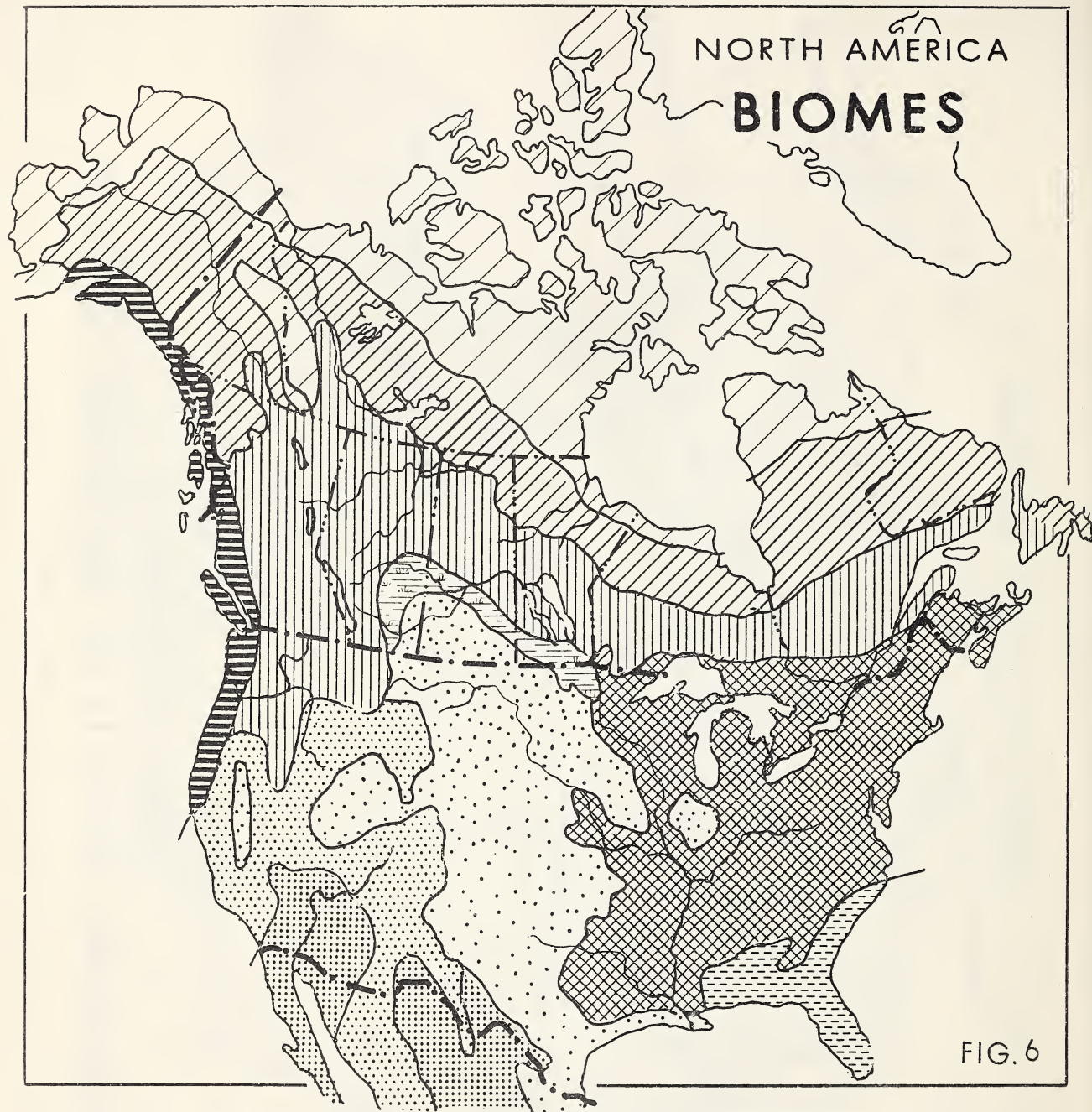





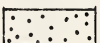

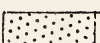

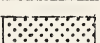


FIG. 6

- |   |   |
|---|---|
|  Tundra            |  Hardwood forest |
|  Forest/tundra     |  Southern pine   |
|  Boreal (conifers) |  Grassland       |
|  Coastal conifer   |  Desert          |
|  Aspen parkland    |  Forest brush    |



growing seasons. For instance, in southern Alberta there is a region which on the average is free of killing frost for 180 consecutive days in the year. In the far north of Alberta the growing season is 40 days shorter. This obviously affects vegetation and consequently affects soil types to some extent. The temperature difference will also affect the distribution of animals markedly.

You must keep in mind that the maps shown here are greatly simplified. For example, the distribution of soil types is much more complex than is shown. More detailed maps are available for specific regions of the country. Universities and Departments of Agriculture and Natural Resources and other agencies provide detailed information on these topics to interested parties. Consult the Atlas of Canada. Published by the Canada Department of Mines and Technical Surveys in 1957, this wonderful compilation of maps shows many aspects of our country that are of interest to biologists. Most of the foregoing illustrations are based on Atlas of Canada maps.

If we look at North America as a whole we can see what relationship the Prairie Provinces bear to the rest of the continent. Fig. 6 shows the general arrangement of vegetation zones (life zones; biomes) across the continent. These have been arrived at by biologists after careful study of geology, soils, climate, vegetation and animal life, as we have just done. If you have travelled in Canada or the United States, think back and try to picture what the countryside was like where you have been. Do the different types of countryside you saw agree with the general distribution and classification of life zones shown in Fig. 6?

It must be kept in mind that the vegetation zones shown in Figs. 4 and 6 are natural zones, that is they represent what biologists believe to have been conditions before the white man arrived to change the prairies into a vast agricultural and industrial region. The changes wrought by man have been great and have had marked consequences. Agriculture has modified the grassland. Wheat and other cereal crops have replaced the native grasses; in broken land and roadside allowances weeds flourish. Many of these weeds are not native plants but have been brought in by man, e.g., leafy spurge, Russian thistle, sweet clover, couch grass and field bindweed. Probably at least 45 percent of our common weeds are not native, but have been introduced by man.

Small animals, especially insects, mites and other arthropods, dwell in the soil in very large numbers.

Generally these animals are very sensitive to changes in soil texture such as may be brought about by agriculture. Both the western grain wireworm (the larva of a "click" beetle) and the pale western cutworm (the larva of a moth) were rare insects in Alberta until soil texture was loosened by man. Now, there may be ten million wireworms in an acre of farm soil and cutworms may be so numerous as to hold up trains by greasing the rails.

Much of the aspen parkland, and even some of the boreal forest areas have been cleared and planted to grain. This process has been accelerated since giant power machinery came into general use in the late 1940's. What will be the consequences of it? We must consider how our activities affect the soil by altering its texture, and perhaps over many years, its type.

Cattle and sheep can affect the vegetation of the land over which they graze by selecting desirable plants for food, by trampling the vegetation and hard-packing the soil and by muddying watercourses and stripping their banks of vegetation.

The establishment and growth of towns and cities replaces soil by concrete. Waste disposal and sewage can disfigure the countryside and pollute streams. The air is affected by the presence of cities as gases and fumes from the furnaces pour out of the chimneys to darken the sky and raise the temperature.

The presence of man and his cities makes it impossible for many plants and animals to survive because the habitat is drastically changed. Other forms of plants and animals thrive with man.

But man must have agriculture and he must have cities. Therefore he must expect changes. Nonetheless, the agricultural products he raises still depend largely upon the soil and climate of the region. Nature cannot be flouted entirely.

If man makes an effort to understand Nature and the requirements of plants and animals, he can successfully conserve wilderness areas or particular types of wild plants and animals, as well as make his own agriculture more successful. Man in agreement with Nature can have a pleasant life.

From here on, we shall concentrate on the biology of Alberta. We shall discuss many plants and animals of the province, their distributions, habits and what can be done to preserve them and utilize them to our best advantage.

# THE DISTRIBUTION OF ANIMALS IN ALBERTA

Perhaps we can illustrate, in a general fashion, something of the way in which animals are distributed by considering the very common mammals called ground squirrels or gophers (*Genus Citellus*). In Alberta there are five species of ground squirrels which differ in appearance, habit and habitat. Here is the list of Alberta ground squirrels:

1. *Citellus richardsonii*—Richardson's ground squirrel, or the prairie gopher. If you live in the prairie or aspen parkland, you probably are familiar with the gopher, a yellowish-grey rodent that lives in roadside allowances and cultivated fields. The gopher abounds on the prairies, taking advantage of cultivated grains for food and thriving in dry regions. It is 10-12 inches long from nose to tail tip. Fig. 7 shows the distribution in Alberta of Richardson's ground squirrel and the other species discussed below.
2. *Citellus franklinii*—Franklin's ground squirrel. This animal is also called a gopher, but on close examination is seen to be rather different in appearance from Richardson's ground squirrel. Franklin's ground squirrel may grow as long as 13-15 inches. It is darker in colour than Richardson's and has a much bushier and longer tail. The colour is not uniform; it is a mottled yellow and brown behind a greyish head. Franklin's squirrel overlaps with Richardson's in its distribution, but is more or less limited to the area we have called aspen parkland. This ground squirrel avoids cultivated fields, preferring long grass and weedy vegetation or aspen groves. As a result, it is far less a pest to farmers. It is not as abundant as Richardson's ground squirrel.
3. *Citellus tridecemlineatus*—the 13-lined ground squirrel or striped gopher. This is a relatively small ground squirrel (size to about 10-11 inches), conspicuously marked by thirteen dark stripes running the length of the body. The dark stripes have light spots in them. The 13-lined ground squirrel is found in approximately the same area of Alberta as Richardson's ground squirrel, but it is far less common, digs a less conspicuous burrow and eats more seeds and insects than the latter. It is more widespread than the other ground squirrels, extending to the Gulf of Mexico in the south and Ohio in the east.
4. *Citellus columbianus*—the Columbian ground squirrel, or mountain gopher. This is a large (to 13-15 inches), dark brown ground squirrel which occurs abundantly in colonies in meadows in the foothills and mountains. Its range seems not to overlap that of the prairie gopher (Richardson's). Like the prairie gopher, it is primarily a plant-eater, but living in uncultivated regions, it generally is not an agricultural pest.
5. *Citellus lateralis* — the golden - mantled ground squirrel. This squirrel is often mistakenly called a chipmunk because of the stripes along the sides of

its body. However, it is much larger than a chipmunk, sometimes reaching more than 12 inches in total length. Its head is not striped, as a chipmunk's is but is a golden brown colour. This colour extends like a mantle over the shoulders. The range of the golden-mantled ground squirrel is about the same as that of the Columbian, but the golden-mantled lives in open forests or rocky regions rather than meadows. Golden-mantled ground squirrels can readily be coaxed to eat from the hand; Columbians are less readily tamed and the other ground squirrels are careful to keep their distance from man.

So here we have five species of animals, related to one another, basically similar in structure and habit, but differing enough so that each can survive successfully in a world of limited space and limited food. Each species has evolved preferences in this mode of life so that a wide variety of living situations can be utilized, e.g., cultivated or uncultivated prairie, uncultivated aspen parkland, high altitude meadow and high altitude forests and rocky wastes. Each species inhabits the zone to which it is best fitted. As well as these Alberta examples one could point to the Arctic or tundra ground squirrel, *Citellus parryi*, a large, spotted, grey, short-eared gopher of the northern barrens or the small *Citellus spilosoma*, the spotted ground squirrel of arid southwestern United States, or many others adapted to special environments in the United States and Mexico. A successful group, such as the ground squirrels, can evolve into many varieties to utilize as many environments as the group is exposed to. As we examine other kinds of plants and animals in Alberta we shall see this principle at work time and time again.

Let us examine the distribution of certain cold-blooded vertebrate animals to see clear examples of the limitation of certain species to certain environments. Alberta, because of its long winters and short growing season is not particularly well-endowed with fish, amphibians or reptiles. We have about 40 species of fish, four species of frogs, four of toads, two of salamanders, six species of snakes and one of lizards. Figs. 8, 9 and 10 show the distribution of the amphibians. The leopard frog and chorus frog can be found throughout Alberta, except in the mountains. The leopard frog is mostly green, with black spots. The body is three or four inches long. The most widely distributed of North American frogs, it lives in a variety of habitats, the chief requirement of which is permanent water. The leopard frog is very agile on land. The chorus frog is small-bodied (about 1 inch long), brown in colour, with darker stripes running the length of the body. Its preference is for swampy areas in open grassland. It is common in the Edmonton area. Its voice is the high pitched chirping so prominent in the spring frog chorus. Actually, the chorus frog belongs to an entirely different family of frogs from that of the leopard frog. It is a member of the tree frog group, but it has shorter legs than most of its family and shows little inclination to climb into shrubs and trees.



The wood frog occurs throughout northern Alberta, extending south about as far as Calgary and Drumheller. The spotted frog occurs only in the mountains and foothills.

The ranges of our two salamanders apparently do not overlap. The tiger salamander is restricted to the plains and foothills, extending to the northern limits of the aspen parkland. It is replaced in the mountains by the long-toed salamander.

Look also at the maps to see the distributions of the four species of toads and three of garter snakes in Alberta. It can be seen that preferences are shown by these species for different habitats. This illustrates the biological principle that, in general, similar species inhabit slightly different environments and then gradually diverge in form from one another with the passage of time. Remarkably adaptable over long periods of time, animals evolve to take advantage of all situations that Nature has to offer.

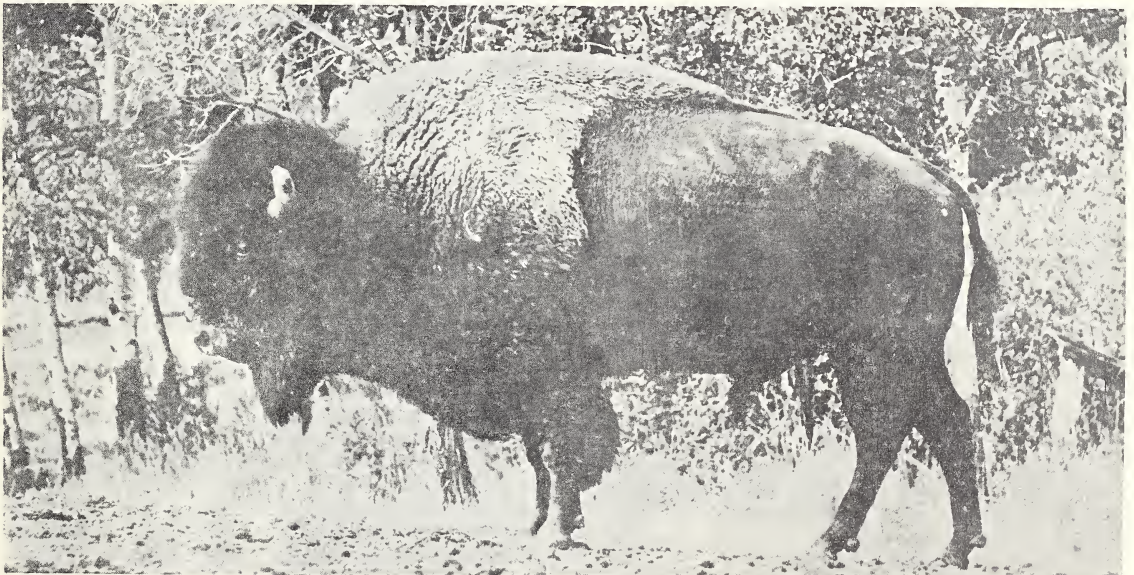
The prairies are the great breeding grounds of ducks. In the spring, hordes of ducks of many species return to the sloughs and lakes of the plains from their wintering grounds in the southern United States, Mexico and Central America. The abundance of ducks is one reason why Alberta is a well-favoured area for the study of wildlife. Here courtship and mating take place, eggs are laid and young are reared. Important stages in the lives of the birds are undertaken. To maintain large numbers of wild waterfowl we must conserve our lakes and sloughs.

The mallard is an important common duck. It nests throughout Alberta, even into the mountains. In eastern Canada the black duck, a species of similar

habit, replaces it. Many ducks, such as teal, baldpates, shovelers, scaups and pintails are found everywhere in Alberta but in the mountains. The gadwall is limited chiefly to the prairie and aspen parkland. Redhead ducks, buffleheads, canvasbacks and the common goldeneye prefer the boreal forest, but extend into aspen parkland. Barrow's goldeneye occurs only in the mountains. The beautiful harlequin also is a mountain duck. Among these varieties are ducks that nest on the ground (mallard, black, pintail), on the ground near water (gadwall, teal, baldpate, shoveler, scaup), over the water in sedges or reeds (redhead, canvasback) or in hollow trees, stumps or similar situations (goldeneye, bufflehead, harlequin).

Different kinds of ducks also have different food habits. Mallards and pintails are enthusiastic grain eaters. Gadwall and teal eat chiefly aquatic insects and vegetation. Shovelers strain great quantities of water through their large bills to collect the small plants and animals they relish. The birds mentioned so far are surface-feeding or dabbling ducks, which we so often see bottoms-up in our sloughs. But many ducks are diving ducks, living mainly in large lakes and getting their food by diving beneath the surface and swimming underwater. Diving ducks include redheads, canvasbacks, scaups, buffleheads, goldeneyes and harlequins. Generally speaking, diving ducks take flight more slowly than surface feeders; they must run along the water to gain speed for flight. Perhaps you have seen a mallard rise nearly straight up from the water with a tremendous burst of power, and, in contrast, a canvasback taking a long, splashy run across the surface before rising into the air.

So again, variety in form and habit is apparent among animals which are basically similar.



BISON

Courtesy: C. G. Hampson



## LIFE ZONES IN ALBERTA

One way to gain a clear idea of the distribution of plants and animals in Alberta is to examine the distinctive types found in the different zones of the province. The map in Fig. 4 shows the zones to be discussed.

*The Boreal Forest.* Here the commonest and most conspicuous tree is the white spruce. Scattered among spruce stands one finds a variety of other trees and shrubs, such as balsam poplar, aspen, willow, currant and rose. On the forest floor many mosses, especially the "feather mosses", are found, together with various herbs such as twinflower, bunchberry, bishop's cap and several pyrolas. Forest fires tend to hold back spruce and allow the faster-growing aspen to develop in burned areas. Black spruce, Labrador tea and sphagnum moss are characteristic of bogs and muskegs. The larch or tamarack is also common there. Sedges, birches and jack pine are common, the latter especially where soil is sandy. In the western boreal forest of Alberta lodgepole pine tends to replace the jack pine. It is apparent that a variety of habitats may be found in the boreal forest: dense spruce forests, aspen and balsam poplar stands, pine forests on sandy soil, bogs and muskegs with and without trees. Throughout these associations one finds many species of shrubs, mosses and lichens.

In the sandy areas where jack pine is common you may find ant lion pits and tiger beetles. Tiger beetles will fly away from you as you walk along, landing and turning to face you at intervals of a few yards. They blend well with their sandy background, but if one is held it is seen to have surprisingly brilliant metallic colours. Handle them with care; their bites may also surprise you!

Certain animals are typical of the northern regions of the province. The wood bison or buffalo has its main refuge in Wood Buffalo National Park which extends from Alberta into the Northwest Territories. There the last great herds of buffalo roam in freedom. Woodland caribou range through northern Alberta in small numbers; barren-ground caribou are found in the forest tundra-transition area in the northeast corner. Marten and fisher, wolverine and lynx are northern carnivores which also extend southward in the mountains. Beaver, muskrat and red squirrels are important rodents. Red-backed and meadow voles, white-footed mice and snowshoe hares are common. Flying squirrels are not uncommon, but are seldom seen because of their nocturnal habits.

The breeding grounds of the bald eagle and the whooping crane are in the north. Some of the few remaining individuals of the latter species breed in Wood Buffalo National Park. In the case of the whooping crane, it appears that we may witness the extinction of a species of animal.

The raven, a great black scavenger, is a common bird of the north. Many owls, woodpeckers, warblers and sparrows occur in greatest abundance in the north.

The lakes of the boreal region have fish-eating lake trout which often reach 60-80 lb. in weight. There are also whitefish and ciscoes, important commercial fish which are plankton-feeders, and the inconnu, "the unknown", a whitefish typical of the north, but of limited value. In fast-running, rocky streams are found odd-looking sculpins. The grayling, a fish to delight the fly-casting angler, is also a stream fish.

The flies which the angler casts are man-made mimics of caddis flies, mayflies, midges and other insects which form a part of the food of many fish. Most of these insects are aquatic in their early stages. The art of fly-tying calls for knowledge of the insects which are food for fish and for an understanding of the behaviour of the fish which are being lured.

Blood-sucking insects also abound. We can divide them into three main groups, each with many species. Mosquitoes develop in the small still pools of snow water which persist long in the spring. The robust, buzzing horseflies or bulldogs with green-striped eyes develop in the muskegs. The blackflies, or white-socks, tiny lively flies with white bands on their front legs, which often crawl inside the clothing to bite, develop only in running water. In all three groups it is only the females that bite; but they can make life unpleasant enough. Dragonflies and damselflies develop in water as well. As nymphs and adults they are fierce predators which help control the numbers of a variety of aquatic and flying insects.

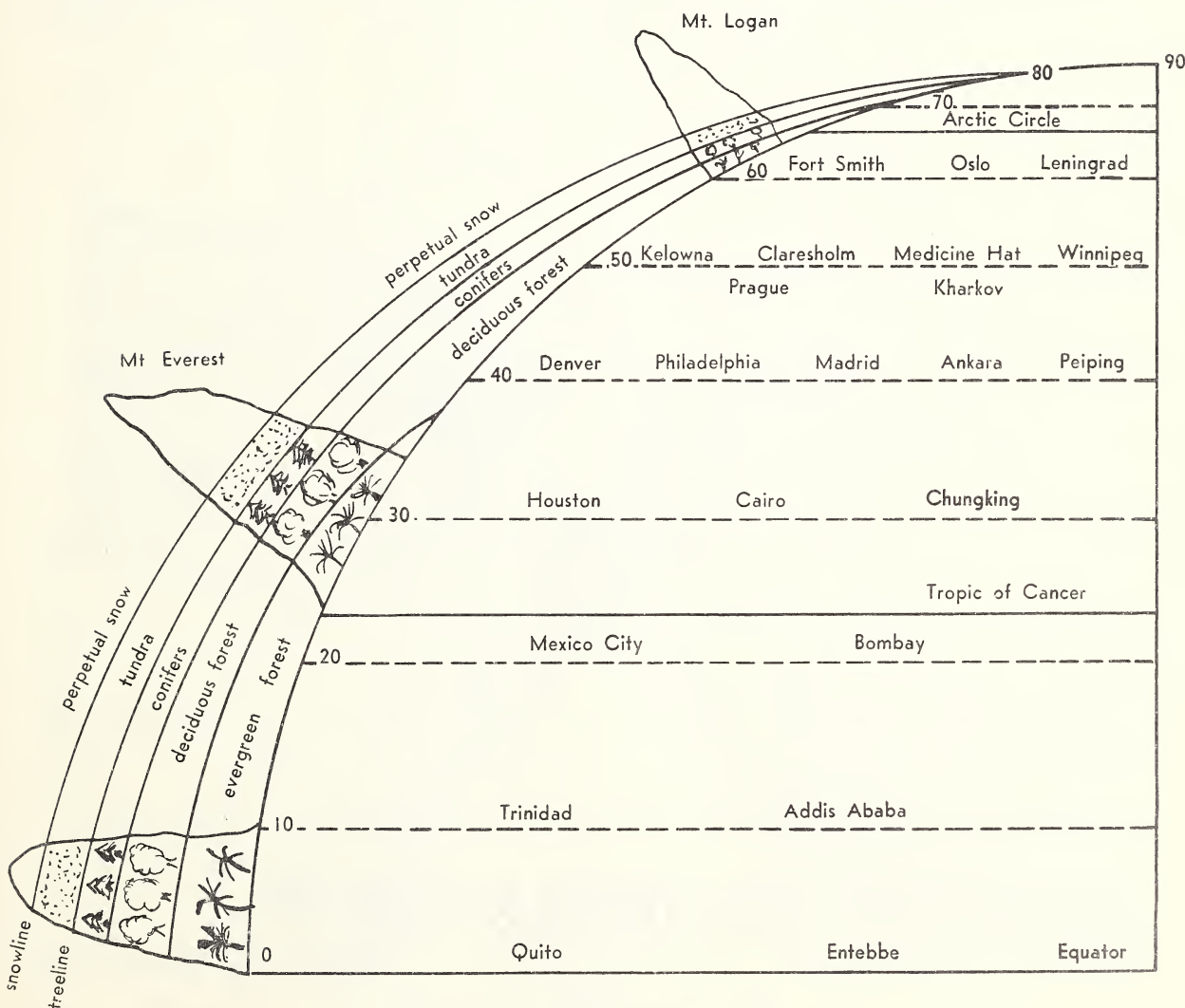
The north is the least explored of Alberta's regions. The chief reason for this is difficulty in transportation. The extensive spruce forests and the muskeg mingled with them form a great barrier. The forests themselves are a source of wealth in wood and pulp and they harbour the animals that form an important recreational asset for tourists and hunters and a source of livelihood for Indians and other trappers. The lakes provide rich crops of fish for markets throughout Canada and the United States. Beneath the surface of the land lies mineral wealth, probably chiefly petroleum. But the muskeg holds back the explorers, forcing them to work in winter when the quaking bogs are solid. The advent of timber crews and oil explorers can disturb the wilderness and chase out animals and disturb plant associations if steps are not taken to preserve the natural domain as much as possible. Here is a problem we must face together: how do we balance the needs of man for oil and metals and wood with his need for tracts of natural surroundings where the comity of plants and animals is possible? By studying animals in detail in their proper settings biologists can arrive at an estimate of the amount of hunting, fishing and prospecting that can be allowed so that man may be satisfied while the animals also flourish in natural surroundings. We must take stock of what we have and protect the region against indiscriminate and thoughtless cropping and exploitation. Man finds it difficult to measure his need for relaxation in natural surroundings, to put a value on the joy he gets from seeing

trees and birds and flowers and wild animals by clear streams. But if he does away with these things for what might prove to be a temporary advantage of another sort, he shall know their value too late.

*The Mountain Region (Subalpine and Alpine).* In many respects the mountain region is a southward extension of the boreal forest and tundra zones but there are many differences too. As one goes higher into the mountains marked changes occur in the nature of the plants and animals that are found. These changes are rather like the changes that occur as one goes north, but they are encountered much more rapidly in mountains because the distance travelled is so much less. One degree of latitude (about 69 miles) is roughly equivalent to 400 feet of altitude. The reason for such similarity is chiefly because of temperature: the farther north one goes, the colder it gets; the higher one climbs, the colder it gets. Figure 12 illustrates the similarities

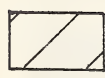
found. The mountain region covers a much less extensive area than most other regions of the province. Being an area of great natural beauty and being difficult to exploit because of topography, much of our mountain region has been preserved for our enjoyment and that of our descendants. Within easy reach of all, plants and animals in untamed settings are to be found. It will be wise of us to treat these areas with care and respect, because before long little wilderness will remain for us to enjoy.

In the mountains, white spruce is one of the most important trees, at least to heights of 6,000-7,000 ft., above which Engelmann spruce and alpine fir tend to replace it. Lodgepole pine is abundant and commonly replaces spruce after fires, but if the forest is undisturbed eventually the pine will be replaced once more by spruce. Douglas fir occurs in isolated areas and alpine larch is commonly found just below timber line.

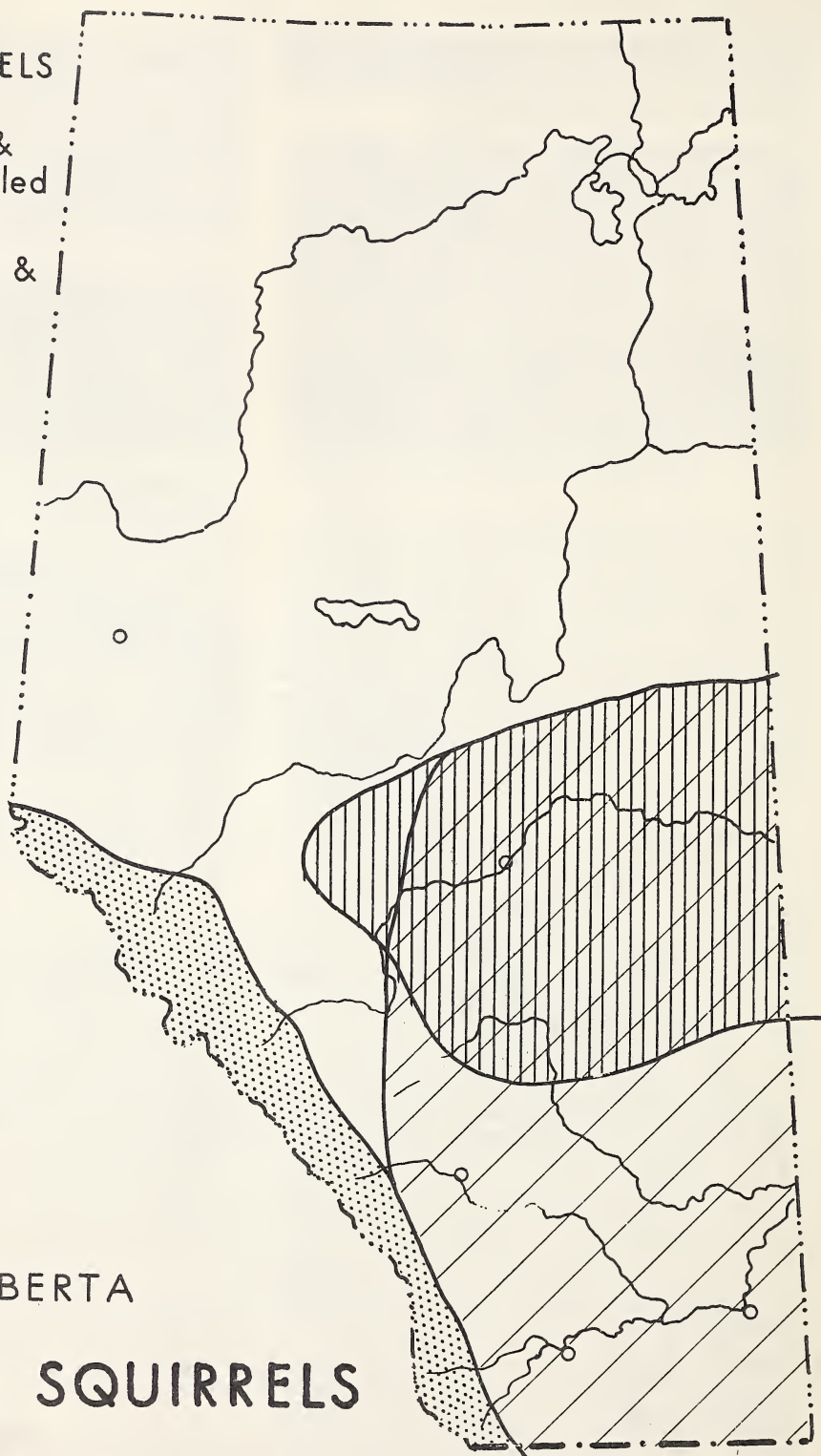


# GROUND SQUIRRELS

 Columbian & golden-mantled

 Richardson's & 13-lined

 Franklin's



# GROUND SQUIRRELS

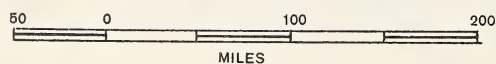


FIG. 7



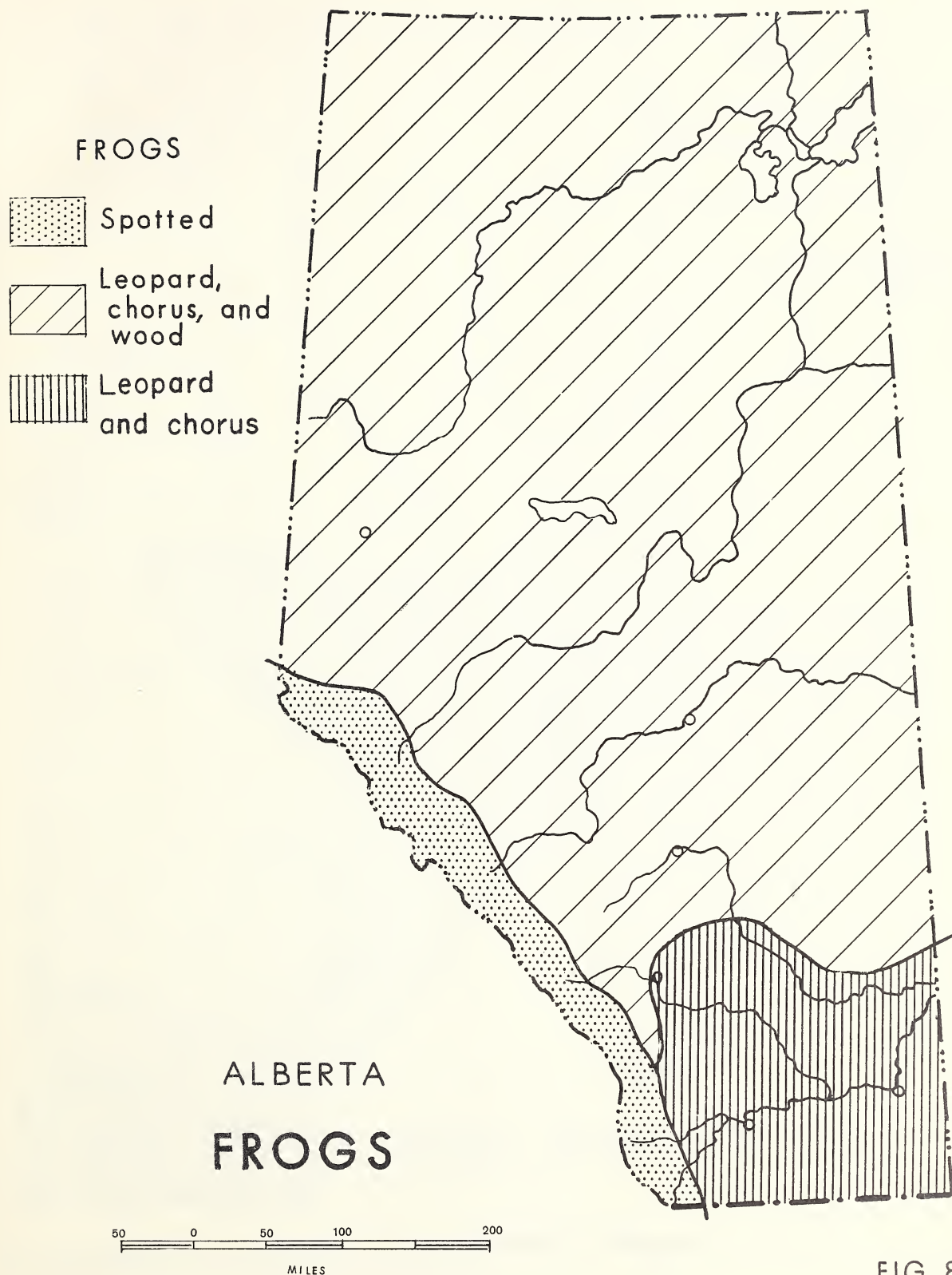




FIG. 8

# TOADS

 Great plains and  
plains spadefoot

 Woodhouse's

 Western

## ALBERTA TOADS

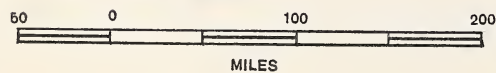


FIG. 9



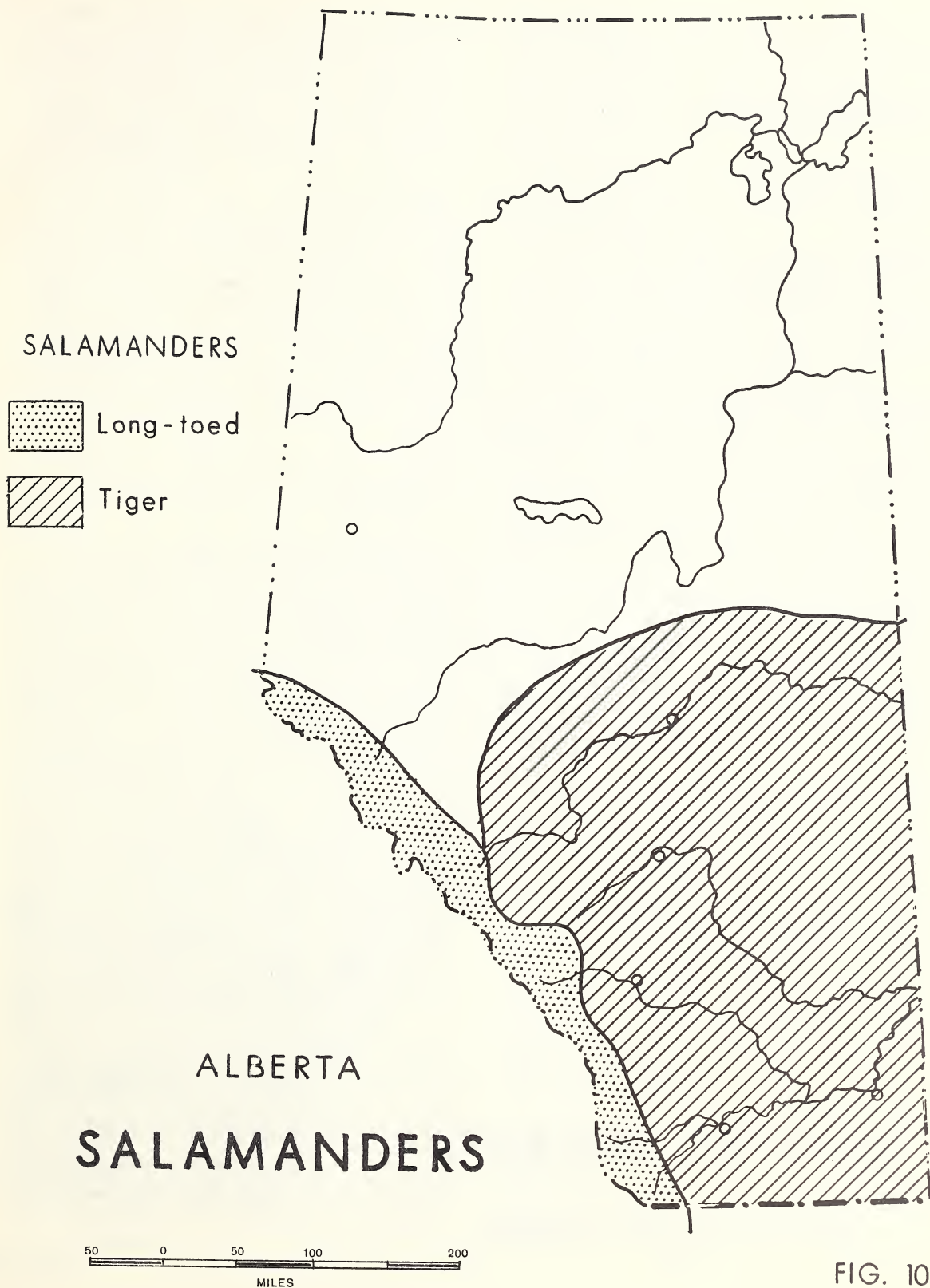
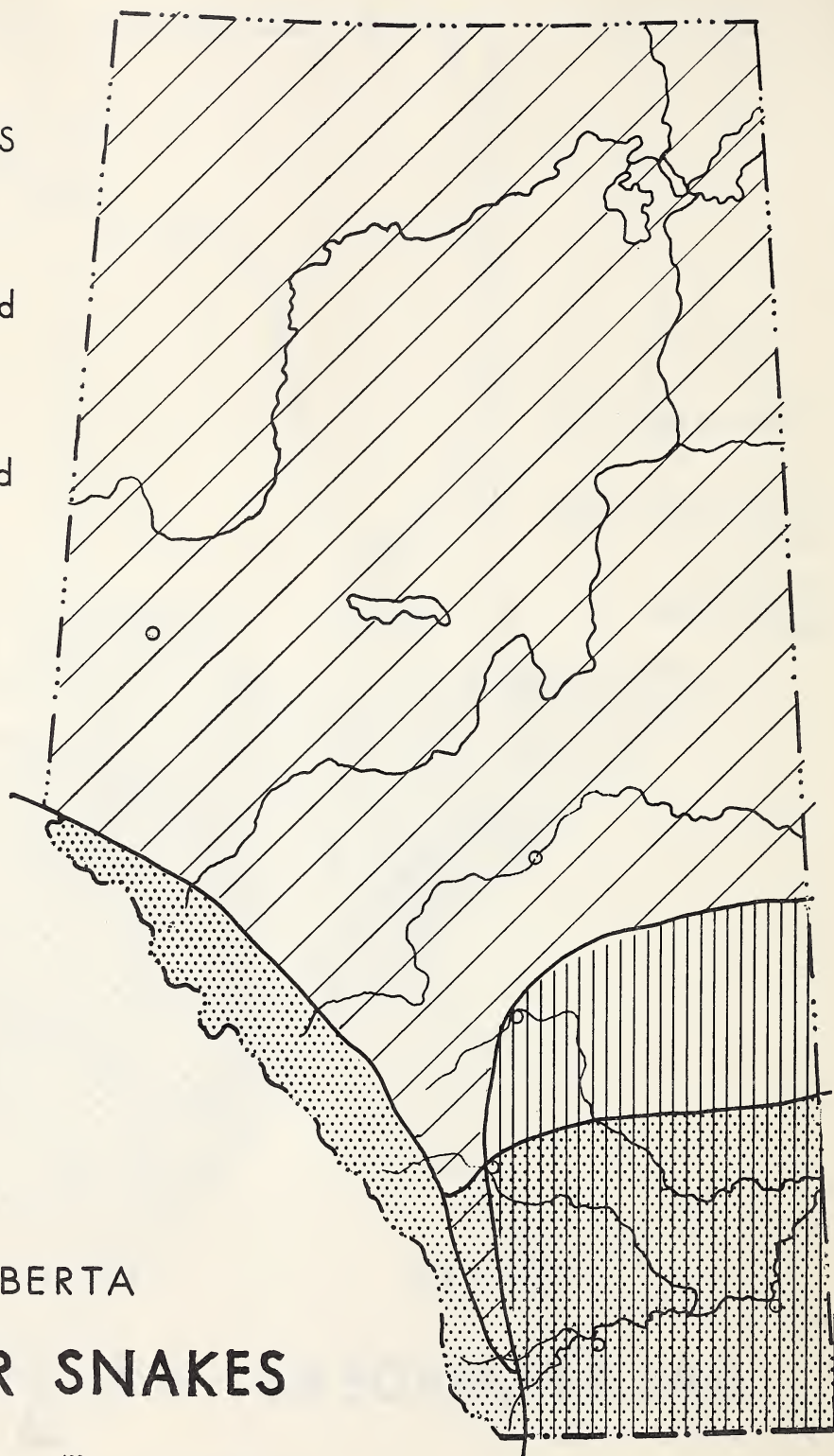
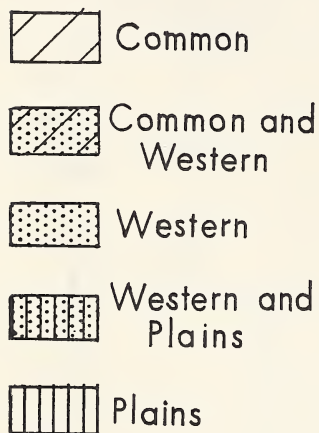


FIG. 10

# GARTER SNAKES



ALBERTA

# GARTER SNAKES

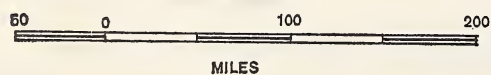


FIG. 11

Aspen poplar is common in stands at lower altitudes. If conditions are right, it will grow instead of pine after a fire. Beavers often are found near aspen groves; they may use up all the aspen, then move on. Junipers, bearberry, Indian paint brush, certain orchids, twin-flowers, fireweed, clematis, cinquefoil and asters are among the smaller plants often prominent in different parts of the mountains.

In the higher mountains, near or above timber line one comes upon the beautiful alpine meadows that are said to have a greater diversity and profusion of flowers than any region in the world. When the flowers are in bloom, especially during July, a fabulous blend of colours carpets valley floors. No list of plants nor attempts at description can do the sight justice, but some of the common ones are grasses, cinquefoils, anemone, alum root, three-flowered avens, louseworts, alpine forget-me-not, mountain avens, and many saxifrages. Most of these plants are similar to those of the northern tundra, but some are found only in these meadows.

Still higher on exposed rocks and near snowfields are found lichens, mosses, creeping grasses and sedges and other low-growing plants such as snow lilies and anemones.

Many of the animals of the mountain region are the same as those of the boreal forest, e.g., black bear, lynx, moose, wolverine, fisher and marten. Mule deer are common in the mountains but they also occur throughout Alberta. White-tailed deer, which live mostly in the aspen parkland and on the prairies do sometimes range into the foothills and eastern slopes of the Rocky Mountains in the southern part of the province. Among the animals mostly restricted to the mountains in Alberta is the elk which, next to the moose, is the biggest North American member of the deer family. The Rocky Mountain bighorn sheep and the tremendously agile, shy, white mountain goat are found only in the mountains.

The cougar and the grizzly bear are mountain predators. Generally they avoid man; sometimes they range into forested foothills. Large carnivores such as these help to hold in bounds the number of deer and sheep and other herbivores. In many cases it is the old, the sick or the weak that fall before them. Without control by predators and other natural forces, the numbers of herbivores increase until there are too many to live on the available food. Then forests and meadows are stripped and hungry animals die by the score of starvation or disease to which they have no resistance.

In the National Parks it is necessary every few years to reduce the numbers of elk, or deer or bison by shooting, so that the range can properly support those individuals left. It is the job of biologists to judge these conditions. In areas where hunting is allowed, biologists must be prepared to recommend regulations that will take into account the numbers of game animals available, the condition of their range, the numbers of young the animals can produce to maintain themselves and the number of hunters expected to take part in the hunting season.

Another animal typical of the mountains is the pika or rock rabbit. It is a short-eared relative of rabbits and hares which lives in rock piles. It is very shy. Coloured much like the rocks in which it lives, it is seen only by the keen-eyed. Listen for its shrill whistle; hunt in the rocks for the piles of hay it makes for its winter food supply.

Columbian and golden-mantled ground squirrels are mountain rodents. So are marmots (whistlers) which are rather like large woodchucks and have somewhat similar habits.

The mountain whitefish (often called "grayling") is a stream and lake dweller of the mountains. Cutthroat and Dolly Varden ("bull") trout are native to Alberta mountains. Rainbow, brown and brook trout have been introduced by man. Biologists are active in the study and propagation of these game fish.

Certain birds stay mostly in the mountains. We have already mentioned Barrows's goldeneye and the harlequin duck. The golden eagle nests in the mountains although it also extends into the southern Alberta prairies. The blue grouse and white-tailed ptarmigan are mountain birds. Clark's nutcracker is common in the mountains. Often, it comes around camps with its bolder cousin the Canada jay ("whisky jack"), which is a bird of the boreal forest and the mountains. The dipper, or water ouzel, is a little grey mountain bird of distinctive habits. It lives along streams, hopping from rock to rock, dipping and bobbing. The dipper plunges into swiftly flowing water to feed on aquatic insects. It seems to run along the bottom of the stream, catching its prey. When disturbed, it flies low along the stream chirping excitedly. Numerous other small birds are restricted to the mountains. The common loon, the osprey and the spruce grouse are examples of birds of both the boreal forest and the mountain region.

We have already described the mountain distribution of the spotted frog and the long-toed salamander. The western toad is the only toad in the mountains.

So again we see how distinctive plants and animals have evolved to fill niches in distinctive habitats.

*The Central Plains (Prairies and Parklands).* This plains region, making up the major part of Alberta's rich agricultural area, presents a gradual change from southeast to northwest. The arid, brown soil, short grass prairie of the southeast is replaced by mixed grass prairie and dark brown soil, then by black soil and aspen parkland. Grama grass, spear grass, quack grass and bunch grass or fescue are prominent, the first more to the southeast, the last more in the parklands. The parkland is dominated by groves of aspen with balsam poplar in moist localities.

The distribution of the prairie grasses is largely conditioned by the climate, and both affect the nature of the soil. What plants can become established often depends upon the soil. How the soil develops further then depends upon the plants. Both reflect climatic conditions. For instance, brown soils receive relatively little moisture and bear relatively scanty plant growth. Because of the scanty plant growth, little organic matter



is available to the soil. Rapid evaporation owing to high temperatures and strong wind extracts water rapidly from the unprotected soil, concentrating minerals too highly for good growth of plants. Conditions are somewhat better in the dark brown soil zone than in the brown. The black soil zone is Alberta's most fertile belt. Here sufficient rainfall and plant growth to provide organic matter for the soil results in a rich, productive topsoil which maintains itself, under proper farm practice, year after year.

Other influences also affect plants and soils. Overgrazing can result in the replacement of a good fodder grass by a less satisfactory kind which may be tougher and faster growing. For example, the tall bunch grasses can be reduced and replaced by quack or spear grass if grazing is severe. Fire, too, plays a role in the prairies by holding back the spread of aspen. Browsing and gnawing animals retard the growth of trees. Extended drought reduces the numbers of trees, for example aspen, the seeds of which require continuous moisture during most of the time of germination.

Apparently our parkland with its characteristic appearance of isolated groves of aspen standing amid tall grass has extended southward since the region became settled. Perhaps the reduction of fires with settlement has allowed the aspen to spread. A new balance has been struck. Here man has become important with his ability to change natural balances more rapidly and decisively than any natural force before him.

Across the prairie and parkland is a large and distinctive fauna. Characteristic birds include Swainson's hawk, the American goldfinch, the western meadowlark, with its delightful song, and Brewer's blackbird, the migrating flocks of which in August and September portend the coming of autumn. The black and white lark bunting is restricted to the prairies. The sloughs and lakes of the prairies support many shorebirds including the willet, the American avocet and Wilson's phalarope. Well-known to all plains dwellers in Alberta are the two famous introduced game birds, the ring-necked pheasant and the Hungarian partridge. The pheasant, originally Asiatic, was long ago introduced into Europe. Initially it was introduced here about 1908 but was not successfully established until much later. Now it is well-established and very popular. The Hungarian partridge, also brought in about 1908, established itself quickly and has long been a prime game bird in Alberta.

Many of the mammals of the plains, such as coyotes and white-tailed deer, extend into the mountains or boreal forests. Distinctive plains animals are the plains bison (now found only in reserves), and the pronghorn antelope, which is the only species of its family and is restricted to the North American prairies. Both sexes of the pronghorn have horns, which like the cow's horns, slip over bony cores. But, unlike the cow, the pronghorn sheds the horn sheath every year. Pronghorns are among the fastest mammals and have been clocked at from 60 to 70 m.p.h. for short distances. With keen senses, great speed and protective colouration, they are wonderfully adapted for life on the prairies.

Badgers are prairie animals living almost exclusively on ground squirrels. The jackrabbit and cottontail are plains dwellers, but the cottontail keeps more to the denser vegetation along water courses. The northern pocket gopher (which is often mistakenly called a mole) is a burrowing rodent found chiefly on the plains, but also in the southern Alberta foothills and the southern reaches of the boreal forest. Remember the plains ground squirrels we discussed earlier: Richardson's, Franklin's and the 13-lined ground squirrel. There are many other distinctive plains animals, of course.

Ponds in both the prairies and the parklands are basically quite similar, the only real difference being a zone of willow, balsam poplar and aspen around those in the parkland, while on the prairies this zone is treeless or made up only of willows. Plants occur around the ponds in definite zones. First there is a group of plants extending from moist ground to shallow water, made up of sedges and tall grasses, spikerush, bulrush and cattail; next there is a band of partially submerged plants including arrowhead and water plantain and finally there are the truly aquatic pondweed, duckweed, mare's tail and water milfoil, as well as many species of algae.

The lakes of the plains hold many fish. Most common are yellow perch, yellow walleye (pickerel) and northern pike. All of these extend far north in the province.

*The Southeast Corner (Shortgrass Prairie).* The southeast corner of the province in the Milk River-Medicine Hat-Manyberries area is a hot, dry land. This is the region where the pronghorn antelope, the cottontail rabbit, the lark bunting, and the prairie falcon are most commonly found. This northern extension of the vast semi-desert regions of the United States is the only place in Alberta where the spadefoot toad, the short-horned lizard (horned toad), the western rattlesnake, the gopher snake and the hog-nosed snake (both of which are harmless) are found. Other characteristic animals are the kangaroo rat and the sage grouse (a bird which is on the verge of extermination in Alberta). Several unique invertebrates also are found in the region, including a sun spider and a scorpion. Black widow spiders are found there, too. Blue, grama and spear grass are abundant and characteristic of the region. Among the plants restricted to the area are the yucca or soapweed, greasewood, and flowering quillwort. Cactuses also grow there.

The advent of farming in the prairies has resulted in much drainage as farmers have tried to obtain more cropland. This has been a serious detriment to aquatic plants and animals with the result that their numbers have dropped markedly. The Prairie Farm Rehabilitation Act (PFRA) which is now active in the establishment of new reservoirs in the area helps counteract this trend. It is to be hoped that this work will continue as it will not only provide water for irrigation and for watering stock but will materially aid our dwindling populations of prairie wildlife. While some animals can survive by taking their water from the food they eat, for example the sage grouse and the kangaroo rat, most others are forced to visit ponds or streams.

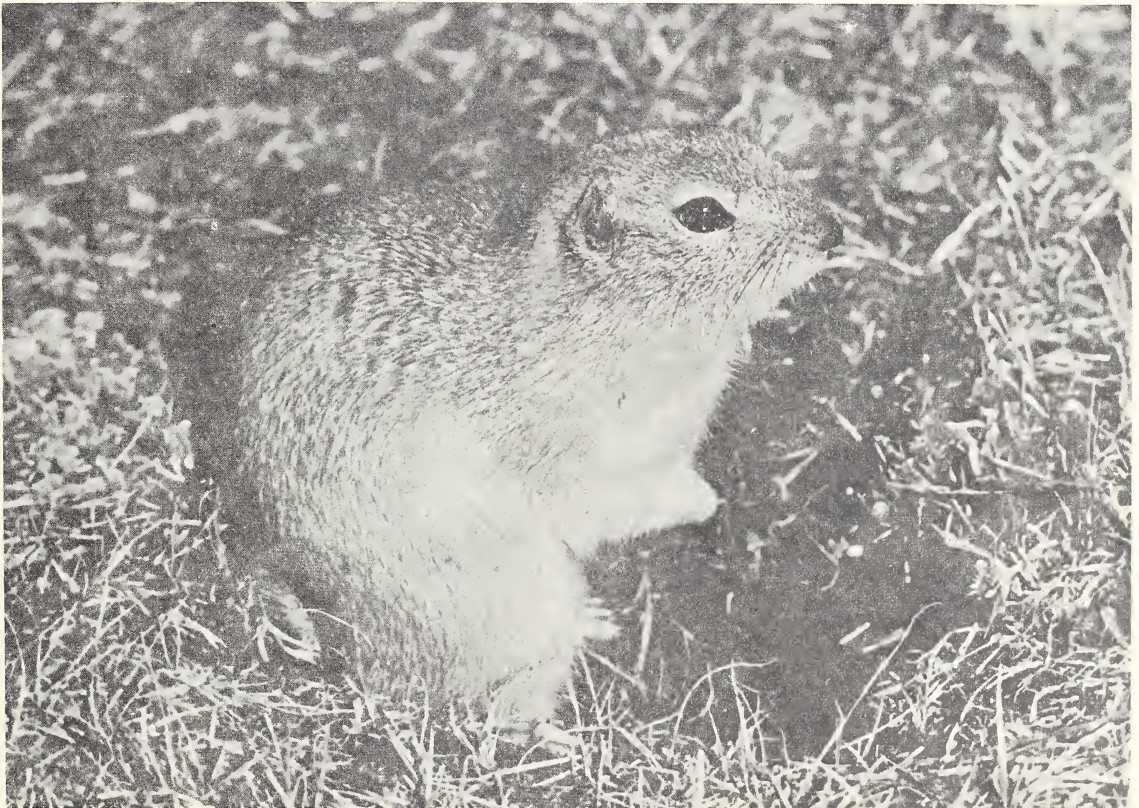


*The Cypress Hills.* The Cypress Hills, which form the highest elevated plateau in the plains of western Canada, are located in the semi-arid southeastern corner of the province. Below the soil layer a cap of hard conglomerate has prevented the erosion of softer underlying shales and limestone and is responsible for the creation of the hills as the surrounding land was washed away. As contrasted to Medicine Hat, in the surrounding short grass area, the region receives around five more inches of rainfall a year, and averages at least three degrees cooler. To a biologist, the Cypress Hills are of interest because they support a rich flora and fauna with a strong representation of Rocky Mountain species. Lodgepole pine and white spruce blanket the northern hillsides and a small area of aspen parkland occupies the top of the plateau. The dusky flycatcher, white-crowned sparrow, Oregon junco, and Audubon's warbler are examples of birds which breed there as well as in the Rocky Mountain region.

*Alberta as a Whole.* This land of varied scenery and many habitats is home to many animals which spread throughout the province. Mule deer, skunks, the

red fox, coyotes and several types of rodents including muskrats, beavers and porcupines occur everywhere. Killdeer and coots, peregrines and pigeon hawks, the great horned owl and the black-capped chickadee, the cedar waxwing, and the mallard duck and the Canada Goose, all can be found throughout Alberta in the appropriate season. The sparrow hawk is one of our commonest falcons. The robin breeds everywhere in Alberta. Certain fish, for example longnose and white suckers, spread everywhere.

Some animals, brought here from elsewhere have found Alberta much to their liking. The starling is an introduced nuisance which originated in Europe, but rapidly spread across North America. It bullies the other birds and usurps their nesting sites. It is hardy and voracious, noisy and dirty. Altogether a pest, the starling serves to illustrate the potential danger in introducing new species which might compete with and overcome native species. Here again biologists must be alert and able to advise on the wisdom of tampering with nature. The pheasant and Hungarian partridge have proved good and useful introductions, the starling and the house sparrow not.



RICHARDSON'S GROUND SQUIRREL

Courtesy: C. G. Hampson



## THE BALANCE OF NATURE

The relationships that exist among the plants and animals that have been described are almost unbelievably complex. Each species has its food requirements, its space requirements and its requirements of temperature, light and water. It is common to refer to "competition" among organisms for these requirements. Organisms which are at any disadvantage in the competition, for any reason, decline in numbers and may become locally or universally extinct. Of course conditions may change (for instance, moist years may follow drought) and the trend to decline may be reversed. Because natural conditions are constantly changing, the numbers of living things fluctuate. As examples, for a few years there may be many hares, then, for some years, hares may be scarce. Or, around a slough willows may predominate for a period of time, to be drowned when the water level rises, and replaced by cattails. In some years sparrow hawks are abundant, in some grasshoppers thrive. In some years Canada thistle is a greater nuisance than in others. We are not always sure what causes the fluctuations.

The relationships between organisms are often called together "The Balance of Nature". This phrase means that living things occur as best they can in the face of the competition of all other living things and the changes of physical conditions (weather, soil conditions, etc.). The Balance of Nature is not something that is the same year in and year out. The balance changes all the time because new and different influences are always affecting one or another member of the natural community. This, in time, affects neighbouring members of the community so that living conditions might be bettered or worsened for different members of the community. The balance will have shifted.

Let us examine an imaginary case, to see how a balance might shift over a period of time. We shall look at a grassy area at the margin of the aspen parkland zone. The grasses there might be chiefly a rough fescue, porcupine grass and June grass. The grasses generally prevent the establishment of aspen; under the proper conditions, grasses are more successful competitors for soil than aspen. But the situation can be reversed if bare areas of soil develop. Such bare areas can be formed by burrowing Richardson's ground squirrels, badgers, pocket gophers or other animals, or by overgrazing and trampling by cattle, or in days past by bison. Bare soil areas give shrubs, such as snowberry, a chance to become established. Perhaps sharp-tailed grouse, using the bare area as a dusting ground, left seeds there in droppings. Other seed-eating birds or wind dispersal can also seed bare areas. If snowberry and wolf willow become established, their shade inhibits grass growth. Coyotes tend to den in shrubby sites, further disturbing the soil and preventing the growth of grass. Changes take place in the insect life of the small area. Some grasshoppers, preferring grass, become scarce, as do some ants. Different species of ants and grasshoppers are found which prefer shrubby habitat. Aspen seedlings appear. As aspen develops, it begins to shade and restrict snowberry and wolf willow. Shrubs come to form a fringe around the

edge of an enlarging grove of aspen. Songbirds are attracted to nesting sites. Flickers and crows inhabit the woods. Snowshoe hare and Franklin's ground squirrels prefer the woods. So does the great horned owl.

As the aspen ages, spruce seedlings may begin to appear. Spruce may be held back if a lot of hares are present to feed on the tender young plants. Fire will stop the development of spruce, while after a fire aspen can regenerate by means of suckers. But these aspen suckers can be held down by the foraging activities of rabbits or other browsers. In such cases, grass will reappear, once again to be the main vegetation, with its own distinctive population of animals.

The story related here is only one of many, many sequences of events that could take place. Successions, as they are called, of plants and animals occur on the prairies, in the parklands, in forests, on mountain sides, and in lakes and ponds. Every living situation is undergoing slow or rapid change.

Part of the balance is tied up in matters of food and feeding. Predatory animals subsist on prey, which in turn must capture other animals, or eat plants. "Food chains" or "food webs" are descriptive terms for the relationships of organisms and their food. A food chain suggests a straightforward series of food and feeders. For example: the northern pike eats minnows and yellow perch, which also eats minnows which eat animal plankton which eats plant plankton. This is a true sequence, but much simplified. It does not take into account the requirements of the plant plankton for light and dissolved chemical substances in the water, it neglects the fauna living in the bottom mud, which is an important source of fish food and which lives itself largely on the remains of dead plankton, and it ignores many other factors which must be accounted for if the lake community is really to be understood. However, from this idea there appears the concept that vast quantities of basic materials are needed to support a few major predators at the other end of the chain. Look at Fig. 13, where this idea is represented by a pyramid. The area of each region of the pyramid represents the weight present in the lake of the material shown. There is much more microscopic plant plankton than there is of the relatively gigantic pike. The levels become smaller as one goes up the pyramid because energy is lost at each step. A major function of nutrition is to supply energy. The activities of obtaining food, metabolizing it, respiring or just sitting still all use energy which is then lost to the organism and returned to the environment. In a sense then, the food supply of any organism represents the energy available to it. In the use of this energy some is lost so it cannot be transferred to another predator organism. Because of a slow but steady loss of energy, over billions of years the whole universe will gradually grind to a halt.

In some respects the food web expresses better the complex relationships between organisms. Fig. 14 shows a greatly simplified web.

The arrows show the direction of movement of nutrients and energy. For example: grasshoppers eat grass and are eaten by songbirds, mice, weasels, hawks and coyotes. Seeds and grass represent plants growing from the soil which is enriched by the return to it of material through the death and decay of all the organisms in the web. Again energy is lost in all the pro-

cesses. But look again at the web: see how vital the grasshopper is to this balance. It is a great pest to man because it eats grassy plants, but it supplies the insect-eating songbird with food, it is taken by the big predators and it can be eaten by small mammals which form much of the food of the big predators. The predators, in other words, help to keep down the numbers

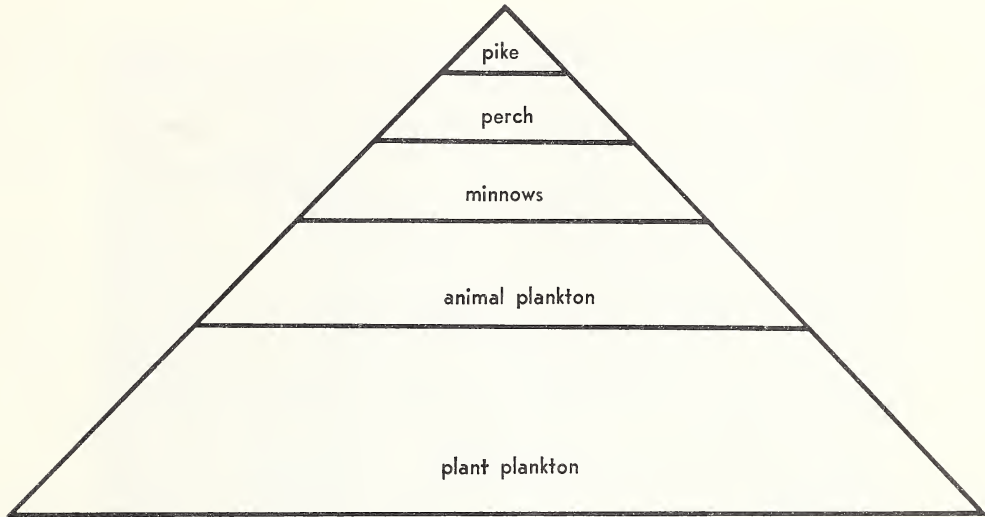


Fig. 13 A pyramid representing the proportional weight of organisms making up a food chain.

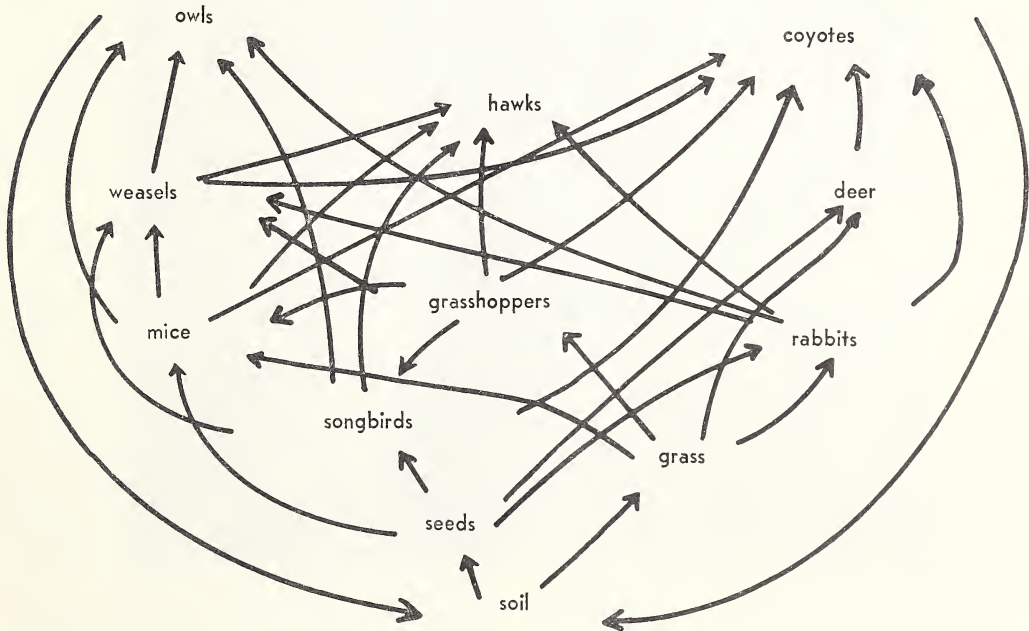


Fig. 14 A food web. Death and droppings return nutrients to the soil.



of mice and grasshoppers, which would be even more serious pests than they are if they were not preyed upon. If we remove the predators fearing for the safety of our farm flocks, we open the gates to floods of rodents. If rodents go, there is more than usual danger of insect outbreaks. If the insects go, insect-eating songbirds will be depleted. This sort of cause and effect can be traced all through the webs.

Once again notice that there are fewer predators than prey. A pyramid of numbers or weight for the food web of Fig. 14 would show owls and coyotes at the top, weasels and hawks more numerous below them, then deer, songbirds, rabbits and mice, grasshoppers and the myriads of the insects and at the base, plants, extracting energy from the sun, the primary energy source for our planet.



FEMALE FLICKER AT ITS NEST

*Courtesy: C. G. Hampson*



# HOW WILDLIFE BIOLOGISTS WORK

How do biologists evaluate the conditions in an environment to arrive at conclusions and recommendations for wise use of renewable natural resources? We have seen what a variety of environments are to be found in Alberta, what distinctive sorts of plants and animals can be found in each and how complex are the relationships between them. It follows that the biologist must know a great deal about the organisms and their environment to be able to pass judgement on the need for good management and use of the resources. He must be a highly trained and keen student of nature. How he undertakes to reach his conclusions is outlined below.

First, it is necessary to know how many animals of the type in which the biologist is interested are present. There must be a census or inventory. The number of animals must be counted or estimated. There are many ways of doing this. One way is to assume that the animals are evenly distributed throughout the region. If one counts the animals in one area of a region and then multiplies this number by the proportional total area of the region one can arrive at an estimated number. However, it must be kept in mind that animals are rarely evenly distributed throughout their range, so a lot of corrections have to go into the calculation. Another census method is to capture, tag and release animals. If trapping is continued, then the proportion of recaptured, tagged animals to captured, untagged animals can be used to calculate a total for the population. For large game animals, such as elk, moose, bison or pronghorn antelope, aeroplanes are often used nowadays. The region to be examined is flown in a regular pattern. The animals are either counted directly or aerial photographs are taken for later examination. Additional census information for many species of animals can be got by listening to calls, studying tracks, examining droppings, dens or nests, and by drawing on the experience of people living in the area.

At the same time as the census is going on, it is necessary as a second step to determine whether or not the population is increasing, decreasing or maintaining the same numbers. We have seen how constantly changing conditions affect the welfare of groups of organisms. The numbers of any one type of animal in an area may vary greatly from year to year. The numbers of an animal depend upon the rate and success in reproduction, the health of individuals, the effects of competition and predation by other animals, the severity of climatic conditions (particularly winter and spring in Alberta) and what is called the "carrying capacity of the range." This last generally refers to the food supply and amount of cover available. To determine the effects of these factors the biologist must study litters of young, he must autopsy samples to discover the incidence of disease and parasites, he must understand the food web in which the animal

exists, he must trudge about in the snow to see how winter affects the animal and he must make an inventory of the animal's food supplies.

When all these data have been collected, they must be organized and analyzed. The work is laborious, but fascinating. Materials are assembled, described, and counted. Figures are tabulated, graphs are plotted. Gradually the bags and bottles of samples, the books full of comments and numbers and the observations of many people begin to show a picture of conditions existing in the animal's habitat. When this occurs, the biologist can diagnose his problem. It will be possible for him to evaluate the limiting factors, that is those things that place limits on the size of the herd or flock of animals he is studying. Perhaps the animals eat all the food available, so no more individuals can be supported. Perhaps predation or disease keeps the numbers down. Perhaps a severe winter means a small crop of animals the next summer or perhaps the rate of reproduction is so high that food and space will be exhausted, so that many animals must move from the region or starve to death. All sorts of limiting factors can be found and often their results are unexpected.

However, once the biologist is able to diagnose the conditions, he is able then to recommend control of the limiting factors so that the animals will occur as abundantly as possible if they are useful and desirable. If the animals concerned are undesirable, the controls recommended by the biologist will be aimed at reducing their numbers to harmless proportions. Control measures might include relaxing hunting restrictions on overabundant animals, both desirable and undesirable, supplying fodder or establishing food plants in regions where food is scarce, controlling disease or parasites or perhaps even introducing some other kind of plant or animal to replace a none-too-successful type. In making the diagnosis and outlining control measures the experience and training of the biologists count heavily. The process of scientific management must continue, for with conditions constantly changing the inventory will change, the limiting factors may change and the diagnosis and control will have to be adjusted accordingly year after year.

In principle, the same management procedures apply to mammals, birds and fishes. The latter group is a bit more complicated in that usually we cannot see its members and their environment is entirely foreign to man. Despite these handicaps, fisheries resources can be managed successfully too, if the patience and care of scientific procedure is followed and the experience of the fishery workers is brought to bear on the data collected. Not only has man brought great and often destructive changes on the face of Nature, but by observing Nature and working with her, he is able to bring about great changes for the good.

## SUGGESTED EXERCISES

The Provincial Fish and Wildlife Officer for your region might be able to visit your class to explain the rules and regulations governing the use of fish and wildlife, the biological work being carried on in your region, or the kinds of renewable resources most abundant in your district. However, there are many things you can do yourself to study the biology of your district.

1. A trip into the fields in the spring when temporary ponds and puddles are still about will be interesting. Take fine dip nets and collecting bottles. You will be able to bring back fairy shrimps, daphnias and insect larvae such as those of caddis flies and mosquitoes. Collect as many things as you can and bring them to class to be identified, using the reference books in the list with this unit. Learn what you can about their life histories.

2. Spring flowers are abundant. How many species can you identify? With what other plants are they associated? What animals live in and around them? Do they grow in moist or dry situations?

3. When the ground dries in the spring and plant growth is well-established, when the days are long and warm, go into a field and dig up a square foot of earth to a depth of four inches. Collect it carefully in a pail, being sure to keep all the plants and leaf litter with it. Take this material to class; carefully sift the dirt and examine all the plant material over a white cloth. How many animals did you collect? How many phyla are represented? How many species? Which is most abundant? How many species of plants are found in the sample?

4. Devise a program to estimate the numbers of some species of small mammal (ground squirrels, mice, voles, etc.) in an acre of land near your school. Try to verify your estimate by sampling with live or snap traps. How many predatory birds (hawks, owls, crows) does this acre support? How many grasshoppers?

5. The birds of a woodlot or of a given area of prairie can be fairly accurately counted by observation. In some such restricted habitat try to determine the number of individuals present and the number of species. If the census is done in the spring, look for nests and broods. Which species is most abundant? Which is rearing the most young? Can you recognize the territories established by individual birds?

6. Build a bird-feeding station where it can be observed without the birds being disturbed. Protect it from cats and other predators. Stock it with bread, grain and suet. Record how many different species of birds use it. Watch the behaviour of the birds; some species and some individuals are more aggressive than others. What times of day are most used for feeding? Do different species appear at different seasons of the year? What effect does changing weather have on feeding times?

7. Lakes, streams and rivers are excellent sampling areas. Dip up water in a wide-mouthed jar and

examine it, preferably with light shining through it, or in a white dish. Examine a drop under a microscope. How many kinds of plants and animals can you identify? Scoop up a sample of muddy bottom. Strain this mud through a fine screen (about 30-35 meshes per inch). When the sample is thoroughly washed, try to identify the organisms left behind on the screen. What is the relative abundance of the various animals found?

If the bottom is rocky and the current swift, lift up a number of rocks to find the plants and animals attached. Which is most abundant? What sorts of specializations do you find for life in fast-running water?

If there is a small and restricted place where you can fish with a seine net, capture as many fish as you can. Keep them alive until you have finished seining. Identify the different species. Choose one species and mark every individual of it by clipping off the same fin from each. Use one of either the front (pectoral) or hind (pelvic) fins. Count the marked fish and release all the specimens you captured. Some hours later, when the released fish have had a chance to spread about in the pool in which you seined, seine again until you have caught as many fish as possible. Count the number of marked and unmarked fish of the species chosen that are caught. The ratio of the marked fish (f) recaptured to the total of that species (t) caught by the second seining is proportional to the ratio of the total number marked (F) to the total number (T) that occur in the population.

$$\text{i.e.} \quad \frac{f}{t} = \frac{F}{T}$$

Solve this equation for T to get an estimate of the total population of the species concerned in the pool.

8. Investigate the plant and wildlife of an overgrown roadside ditch. What are the main differences you can make out between the flora and fauna of the ditch and those of neighbouring fields or woods? Do some plants or animals occur in the ditch and not nearby?

9. Compare conditions in neighbouring fields, where one is grazed and the other not. What is the chief effect of grazing? What other biological effects can be seen?

If a stream is available which is accessible to cattle at one place and not at another, compare the two places to see the differences in plant growth and animal life that can be found.

10. In the early spring (April) the singing of frogs is common in Alberta. This is the frogs' mating season. Notice that the frogs stop singing as you approach their ditch or pond. Try to see the frogs. Search in the water for the floating masses of their eggs. The eggs are sometime difficult to find, but when you find some, you generally find many. One frog may lay more than 1,000 eggs. Why is it that frogs are not much more abundant than they seem to be? What natural enemies have frogs?



Take some eggs back to the class in pond water. Watch them develop and hatch into tadpoles. Do not crowd the tadpoles too closely in a small container, and do not let the water get warmer than room temperature (keep it out of the sunlight). Tadpoles, once they

start eating, can be fed small quantities of boiled lettuce or dry Pablum sprinkled on the water daily. It is difficult to have tadpoles change into frogs in an aquarium. It will be best to free them to a pond after two or three months' growth.



MULE DEER IN VELVET

*Courtesy: C. G. Hampson*





SPARROW HAWK COMING TO LAND

*Courtesy: C. G. Hampson*



CANADA JAY LANDING

*Courtesy: C. G. Hampson*





FLYING SQUIRREL

*Courtesy: C. G. Hampson*



PINTAIL

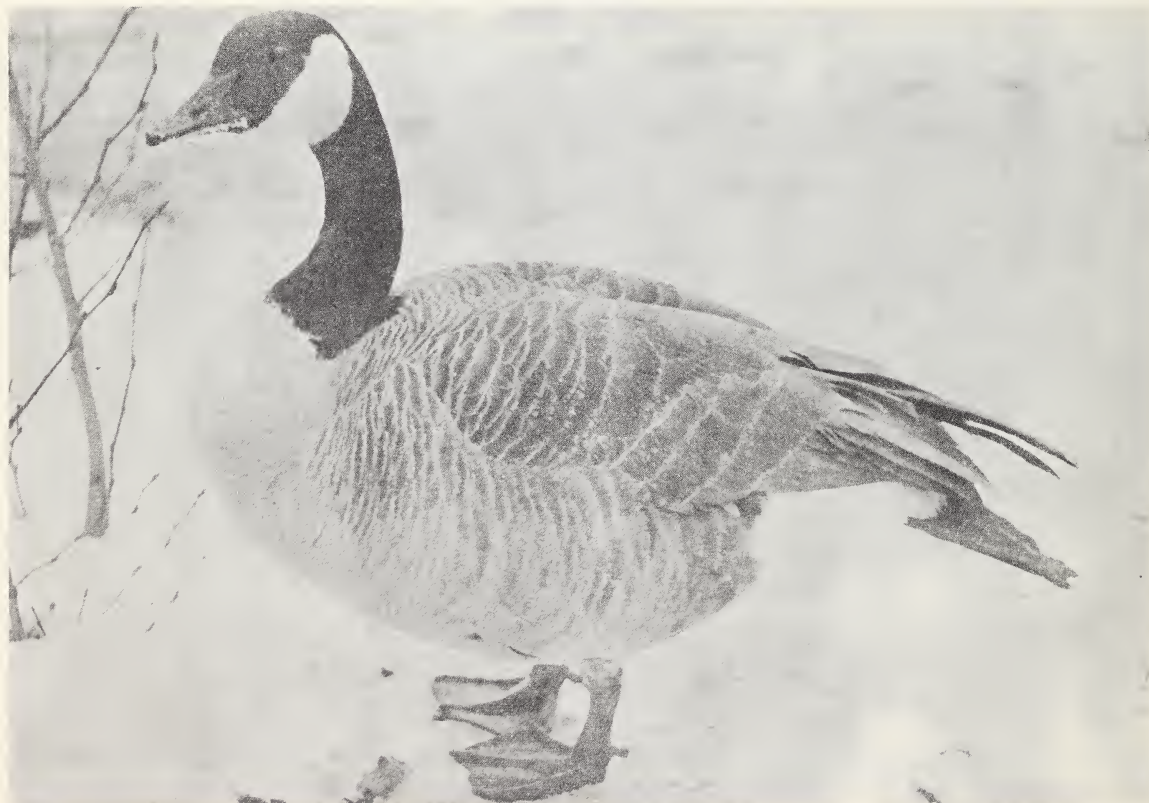
*Courtesy: C. G. Hampson*





RED SQUIRREL

*Courtesy: C. G. Hampson*



CANADA GOOSE

*Courtesy: C. G. Hampson*





PORCUPINE

*Courtesy: C. G. Hampson*

## FOR FURTHER READING

All these books would be useful in a school biology library, but those marked with an asterisk (\*) are especially important.

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# AN ANNOTATED LIST OF THE SPECIES MENTIONED IN THE TEXT ON RENEWABLE RESOURCES IN ALBERTA

This list gives the scientific names and briefly describes the species of plants and animals mentioned as occurring in Alberta. It lists but a tiny fraction of the organisms living in the province, but might help to identify some common or special types. The list is designed to give information to those interested in the names and descriptions of plants and animals; THERE IS NO VIRTUE IN MEMORIZING ALL THESE NAMES! They are not examination material.

A short definition of the scientific name is given where that is possible. A ? with the definition indicates uncertainty in the definition as given here. Generally speaking, the scientific name describes some feature of the organism, or is a transposition of a Greek or Latin name for the organism or one like it, or it honours some person. Again, the definitions are given as a matter of interest only, not as information on which a student is to be tested.

The scientific names are the proper names of the organisms in the same way that Smith, George (Smith—someone who works with metal in a smithy; George—a farmer) is the proper name of an individual person, and as such, it identifies the organism and enables the biologist to speak precisely about the thing with which he is working.

## PLANTS

### Trees

Alpine fir—*Abies lasiocarpa* (*Abies*=the fir tree; *lasiocarpa*=hairy fruit). An evergreen, coniferous tree with erect cones; single, flat, needle-like leaves and non-roughened branches. Common in the mountains.

Alpine larch—*Larix lyallii* (*Larix*=the larch tree; *lyallii*=Lyall, a man after whom the species is named). A deciduous, coniferous tree with four-angled leaves in clusters of 30-40. Found in the mountains near the timber line.

Aspen—*Populus tremuloides* (*Populus*=the poplar; *tremuloides*=trembling). A deciduous tree with smooth bark; broad nearly round leaves with petioles that are strongly flattened laterally; bears catkins. Very common in the parkland and forested regions.

Balsam poplar—*Populus balsamifera* (*balsamifera*=balsam-bearing, referring to the odorous gum). Similar to aspen except that the petioles are circular in cross-section and the buds are coated with a sticky, strong-smelling gum.

Black spruce—*Picea mariana* (*Picea*=a pitch-pine; *mariana*=refers to Mary). An evergreen, coniferous tree with single, four-sided, blunt-pointed, needle-like leaves; roughened branches; hairy twigs; cones that remain on the tree for several years. Common around muskegs in the boreal region.

Douglas fir—*Pseudotsuga menziesii* (*Pseudotsuga*=false larch, *tsuga* being Japanese for larch; *menziesii*=named after Menzies). An evergreen, coniferous tree with drooping cones; single, flat, needle-like leaves; non-roughened branches. Found locally in the mountains.

Engelmann spruce—*Picea engelmannii* (*engelmannii*=Engelmann, a prominent German-American botanist of the 19th century). An evergreen, coniferous tree with single, four-sided, sharp-pointed, needle-like leaves; roughened branches, minutely hairy twigs and flexible seed scales. Found above 5,000-6,000 feet in the mountains.

Jack pine—*Pinus banksiana* (*Pinus*=the pine tree; *banksiana*=Sir Joseph Banks, English naturalist, 1743-1820). An evergreen, coniferous tree with needle-like leaves in bundles of two, and cones that point towards the tips of the branches. Common on sandy soil in the boreal region.

Lodgepole pine—*Pinus contorta* (*contorta*=twisted or bent). Similar to jack pine but for the cones which are at right angles to the branches. Abundant in the mountains and the Cypress Hills.

Tamarack or larch—*Larix laricina* (*laricina*=diminutive of *larix*). A deciduous, coniferous tree with leaves in clusters of 12-20. Common around muskegs in the boreal region.

White birch—*Betula papyrifera* (*Betula*=birch; *papyrifera*=paper-bearing). A deciduous tree with white bark that peels off in thin sheets. Common in central and northern Alberta.

White spruce—*Picea glauca* (*glauca*=silvery white). Similar to Engelmann spruce except for stiff seed-scales and normally smooth twigs. Widespread except in the prairies and parklands and high mountains.

## OTHER PLANTS

Alpine forget-me-not—*Myosotis alpestris* (*Myosotis*=mouse ear; *alpestris*=of the Alps). A low, perennial, herbaceous member of the borage family with bright blue, non-tubular flowers and small smooth nutlets. High alpine meadows.

Alum root—*Heuchera* spp. (*Heuchera*=Heucher, a German botanist of the 18th century; spp.=abbreviation for species (plural), used to mean that several species of this genus are to be found in Alberta). A perennial, herbaceous member of the saxifrage family with five stamens per flower; greenish, yellowish, or purplish petals; a spike-like inflorescence and a long scaly root-stock. Three species in southern Alberta.



Anemone—*Anemone* spp. (Anemone=wind flower). Perennial herbs of the buttercup family with white or purplish sepals which look like petals, bulb-like taproots, long-petioled basal leaves and whorls of leaf-like bracts below the flowers. Eleven species in Alberta, including the prairie crocus.

Arrowhead — *Sagittaria* spp. (*Sagittaria* = arrow-shaped). Marsh plants with large, long-petioled, arrowhead-shaped leaves; milky sap; conspicuous flowers having white petals; produce small potato-like tubers. Common throughout the province.

Aster—*Aster* spp. (Aster = a star). Mostly perennial, herbaceous members of the composite family with white to pink, purple or blue ray flowers; a non-chaffy pappus; with several series of leaf-like involucre bracts around the flower clusters. Twenty-two species in Alberta.

Bearberry or kinnikinnick—*Arctostaphylos uva-ursi* (*Arctostaphylos*=bear grapes; *uva-ursi*=grapes for a bear). A trailing, evergreen shrub of the heath family with flowers having pink, united petals, and with dull red, mealy, flavorless, berry-like fruits. Common except in the parkland and prairies.

Bishop's cap—*Mitella nuda* (*Mitella*=a little mitre; *nuda*=bare). A low herb of the saxifrage family with five greenish-white, finely branched petals, and long-petioled, mostly basal, nearly heart-shaped leaves. Common in wet woodlands.

Blue grass—*Poa* spp. (*Poa* = Greek for grass). A variety of grasses found widely distributed in Alberta, some species preferring dry locations and others moist. Leaves usually with a double line at the midrib.

Bulrush—*Scirpus* spp. (*Scirpus*=Latin for bulrush). Large, marsh herbs with thick rootstocks; conspicuous triangular or rounded stems; inconspicuous flower clusters; either leafy or with leaves degenerate. Common in marshes.

Bunchberry—*Cornus canadensis* (*Cornus*=a horn; *canadensis*=of Canada). A low, perennial herb belonging to the dogwood family with tiny flowers surrounded by four white bracts that look like petals, and with bright red, berry-like fruits. Common in woods.

Bunch-grass or fescue—*Festuca* spp. (*Festuca*=a straw-like weed). A densely tufted, medium-sized grass which is very common in the aspen parkland and the Cypress Hills.

Cactus—both prickly pear, *Opuntia* spp., and ball cactus, *Mamillaria* spp., are present. (*Opuntia*=Latin for a cactus type). Has flat stems in plate-like sections. Bears showy, waxy yellow flowers. (*Mamillaria*=a little breast). A round, cushion-like cactus with clusters of spines and dark red flowers.

Canada thistle—*Cirsium arvense* (*Cirsium*=Greek for a kind of thistle; *arvense*=of the field). A purple or white-flowered perennial, usually growing in patches. Leaves long, curly and wavy, with prickles. Produces white, feathery flying seeds. Caterpillars of the painted lady butterfly and some other caterpillars feed on this thistle and aid in its control.

Cattail—*Typha latifolia* (*Typha*=a plant which makes bed stuffing; *latifolia*=broad leaved). A large, marsh herb with large root stocks, long flat leaves, and conspicuous flower spikes. Common in marshes.

Cinquefoil—*Potentilla* spp. (*Potentilla*=able to roll the eyes, presumably referring to response of flowers to sun). Herbaceous or shrubby members of the rose family with compound leaves, ten or more stamens, and dry 1-seeded fruits. Twenty species in the province.

Clematis—*Clematis* spp. (*Clematis*=a young shoot or tendril). Climbing shrubs of the buttercup family with four white, purple, or blue petal-like sepals. Common in southern Alberta.

Currant—*Ribes* spp. (*Ribes*=a plant with sour sap). Shrubs of the saxifrage family with berries as fruits. Many species throughout Alberta.

Dogwood—*Cornus stolonifera* (*stolonifera* = a plant bearing stolons). A 3-10 foot high shrub with deep red twigs; entire, oval to lanceolate leaves; with white flowers arranged in a flat-topped cluster. Common in woods.

Duckweed—*Lemna* spp. (*Lemna*=Greek for a type of water plant). Minute, flat, aquatic plants which either float on the water or are submersed in it; distinguished from algae by having one or more roots and by the rare appearance of very simple flowers. Common throughout the province.

Feather moss—several species of large, frequently branched, feather-like mosses found on the floors of woods in the boreal and mountain regions.

Field bindweed—*Convolvulus arvensis* (*Convolvulus*=a twisted plant, the bindweed; *arvensis*=of the field). An introduced perennial of the morning glory family; branched stem tends to lie prostrate or twine among other plants.

Fireweed — *Epilobium angustifolium* (*Epilobium* = upper lobes; *angustifolium*=majestic leaves). A perennial herb of the evening primrose family with four rose-purple petals, alternate lanceolate leaves, and seeds with a tuft of hairs at one end. Abundant on burned areas throughout the province.

Flowering quillwort—*Lilaea scilloides* (*Lilaea*=sort of a lily; *scilloides*=like a quill). A small, annual marsh herb with round, linear leaves and flowers from the base of a much shortened stem. Rare and found only in the southeastern corner of the province.

Grama grass—*Bouteloua gracilis* (*Bouteloua*=*Boutelou*, the surname of two Spanish botanists; *gracilis*=graceful). A low, sod-forming, highly nutritious grass with one-sided comb-like groups of flowers. Abundant on dry prairie in southern Alberta.

Greasewood—*Sarcobatus vermiculatus* (*Sarcobatus*=a fleshy bramble; *vermiculatus*=with small, worm-shaped parts). An erect, spiny shrub with widely branching stems bearing narrow, linear, fleshy leaves. Restricted to alkaline flats in extreme southwestern Alberta.

June grass—*Koeleria cristata* (*Koeleria*=an 18th century German botanist; *cristata*=crested). A low, tufted pale grass, with short, veined leaves. A common and valuable forage grass of the dry prairies.

Juniper—*Juniperus* spp. (*Juniperus*=Latin for this plant). Shrubs or small trees of the pine family with scale-like or awl-like leaves and small, bluish, berry-like cones. Three species in the province.

Labrador tea—*Ledum groenlandicum* (*Ledum*=a type of shrub; *groenlandicum*=of Greenland). A shrubby member of the heath family with strongly revolute leaves that are rusty-red beneath; white flowers in flat-topped groups; dry seeds borne in capsules. Common in muskeg areas.

Leafy spurge—*Euphorbia esula* (*Euphorbia*=*Euphorbas*, an ancient physician; *esula*=Celtic for sharp, referring to acrid taste, a proper name). A tall, scanty-leaved plant, with flowers arranged in an umbel.

Lousewort—*Pedicularis* spp. (*Pedicularis*=a kind of louse). Herbs of the figwort family with branched leaves either basal or from the stem; corolla more than 5 mm. long and strongly two-lipped, the lower lip 3-lobed; four stamens; flowers usually in spikes or spike-like clusters. Ten species in the mountains and boreal regions.

Mare's tail—*Hippuris vulgaris* (*Hippuris*=horse tail; *vulgaris*=common). A perennial aquatic with sessile leaves 6-12 in close whorls on the several unbranched stems; flowers green and sessile in the leaf axils. Common in and on the edges of ponds.

Mountain avens—*Dryas* spp. (*Dryas*=a wood nymph). Low, prostrate shrubs of the rose family with simple leaves; 8-10 white or yellow petals; dry seeds with long plumose attachments. Common in the mountains.

Orchid—Perennial herbs with bulbs or bulb-like bases and with 3 petals and 3 sepals which often form showy, irregular flowers. Nine genera and 25 species occur in the province.

Paintbrush—*Castilleja* spp. Perennial herbs of the figwort family with entire or lobed alternate leaves, four stamens, and large flowers with brightly colored bracts. Common in the mountains, boreal regions, and the aspen parkland.

Pondweed—*Potamogeton* spp. (*Potamogeton*=river neighbour). Aquatics with jointed stems, slender alternate leaves with ensheathing stipules, and spike-like flower clusters which float on the surface of the water. Common in ponds and streams.

Porcupine grass—*Stipa spartea* (*Stipa*=tow, or coarse flax; *spartea*=Latin for the shrubby plant known as broom). Associated with spear grass and similar to it. Has long twisted and bent awns, erect leaves.

Pyrola—*Pyrola* spp. (*Pyrola*=a little pear). Low perennials of the wintergreen family with basal leaves and with flowers in racemes. Eight species confined to wooded areas.

Quack grass—*Agropyron repens* (*Agropyron*=field wheat; *repens*=creeping). Common weedy grass of fields, waste areas, and around city lawns.

Rose—*Rosa* spp. (*Rosa*=Latin for rose; *acicularis*=thorny). Perennial shrubs of the rose family with compound leaves and dry fruits produced in a fleshy receptacle called a "hip". One of our roses. *Rosa acicularis*, is the floral emblem of the province.

Russian thistle—*Salsola pestifer* (*Salsola*=saltwort; *pestifera*=nuisance). A spiny-leaved annual of the goosefoot family; can form a tumbleweed in the fall.

Saxifrage—*Saxifraga* spp. (*Saxifraga*=stone breaker). Perennial herbs of the saxifrage family with 10 stamens, white or yellowish petals, and without leathery leaves. Seventeen species occur in the mountains and northern regions.

Sedge—*Carex* spp. (*Carex*=Latin for sedge). Similar to grass except that they have more or less 3-sided, solid stems and leaves that are 3 instead of 2-ranked. Many species occur throughout the province.

Shooting star—*Dodecatheon* spp. (*Dodecatheon*=twelve great gods). Perennial herbs of the primrose family with leaves basal and with the corolla lobes of the flowers sharply turned back giving the appearance of a "shooting star". Common in southern Alberta.

Snowberry—*Symphoricarpos* spp. (*Symphoricarpos*=fruit borne together). A low shrub with creeping roots and bell-shaped pink and white flowers. Bears round, white 2-seeded berries. Leaves simple and opposite.

Snow lily—*Erythronium grandiflorum* (*Erythronium*=a Greek name of this type of plant; *grandiflorum*=showy flowers). A herbaceous member of the lily family with lanceolate leaves, no stem, and showy yellow flowers. Found in the southern part of the mountains where it flowers shortly after the snow melts.

Spear grass—*Stipa* spp. (*Stipa*=tow or coarse flax). Perennial bunchgrasses that are excellent forage plants. The seeds remain enclosed in the tip of a spear-shaped structure which can be very injurious to the mouth parts and skin of grazing animals. Abundant in the prairies.



Sphagnum—*Sphagnum* spp. (Sphagnum=Greek for a kind of moss). Large, white to brownish, extremely absorbent mosses found in bogs in the mountains and boreal regions.

Spike rush—*Eleocharis* spp. (Eleocharis=marsh beauty). Small to medium sized, perennial, rush-like, slough margin plants with basal leaves reduced to bladeless sheaths, and with flowers in solitary, erect, spirally-scaled, terminal spikelets. Six species occur in the province.

Sweet clover—*Melilotus* spp. (Melilotus=a honey-sweet plant). Has yellow or white flowers; often grows rankly in roadside ditches. A member of the pea family.

Three-flowered avens—*Geum triflorum* (Geum=Latin for this type of plant; triflorum=with three flowers). A perennial herb of the rose family with basal leaves having 9-19 leaflets, 10 or more stamens in each of the three red-purple flowers, and with styles that elongate at maturity to become 2-4 cm. long and plumose. Common on open prairie.

Twinflower—*Linnaea borealis* (Linnaea=Linnaeus, the Swedish biologist who first successfully classified living things; borealis=of the north). A creeping, evergreen, slightly woody member of the honeysuckle family with delicately nodding flowers in groups of two, and with white to rose-purple, funnel-shaped corollas. Common in woods in the boreal and mountain regions.

Water milfoil—*Myriophyllum* spp. (Myriophyllum=myriads of leaves). Aquatic, submersed herbs with dissected leaves arranged in whorls and with flowers on an immersed terminal spike. Abundant in ponds and streams.

Water plantain—*Alisma* spp. (Alisma=salt-loving). Marsh plants with long-petioled, oval to lanceolate leaves; milky sap; conspicuous flowers with white petals. Common in southern Alberta.

Wheat—*Triticum* spp. (Triticum=an old Latin name for wheat). A cereal grain much modified by man for various food purposes.

Willow—*Salix* spp. (Salix=the willow, in Latin). Shrubs or small trees with flowers produced in catkins, hairy-tufted seeds, and winter buds covered by a single scale. Thirty-five species are scattered throughout the province.

Wolf willow—*Elaeagnus commutata* (Elaeagnus=a Greek name for a particular plant, meaning roughly an innocent olive; commutata=changed). A shrub with silvery leaves, yellowish, fragrant flowers borne in leaf axils and silvery plum-like fruit. Spreads rapidly on over-grazed land.

Yucca or Soapweed—*Yucca glauca* (Yucca=West Indian name for this plant; glauca=silvery-white). A coarse member of the lily family with tough, linear leaves and numerous, large, greenish-white flowers borne in a raceme. Known from one locality, near Manyberries, in the southeast corner of Alberta.

## INSECTS

Grasshoppers—Many species are present in Alberta. Among the most common are the following.

*Melanoplus bivittatus* — Two-striped grasshopper (Melanoplus=unarmoured thigh; bivittatus=two striped). A brownish colour, with a yellow stripe on each side of the back. Clear wings.

*Melanoplus bilituratus* — Migratory grasshopper (bilituratus=twice erased, referring to pale spots). Small brown grasshoppers with clear wings. Hind tibiae sometimes pale reddish or bluish.

*Camnula pellucida*—Roadside grasshopper (Camnula=?; pellucida=clear). Looks much like the two above. Stripes on back do not reach head. Upper wings spotted.

*Dissosteira carolina*—Carolina grasshopper (Dissosteira=double keel; carolina=of Carolina). A large, dusty-coloured grasshopper with a prominent two-piece ridge or keel on the back. Has black and yellow wings and is noisy in flight.

Tiger beetle—*Cicindela* spp. (Cicindela=a Latin name for a beetle). Very active beetles found in dry, sandy localities. Generally have attractive golden markings on an iridescent background.

Prairie grain wireworm—*Ctenicera aeripennis* (Ctenicera=comb horn, referring to antennae; aeripennis=copper wing, referring to wing cover). The grub or larva of a click beetle. The adults are dark-coloured rather ovoid beetles; the larvae are pale and elongated.

Pale western cutworm—*Agrotis orthogonia* (Agrotis=from a field; orthogonia=? straight jointed). The caterpillar of a mottled grey moth. The larva is greenish grey, with a brown head.

Painted lady—*Vanessa cardui* (Vanessa=the anglicized version of the name of a Greek divinity of certain religious rites; cardui=of a thistle). The thistle butterfly, claimed to be the most widely distributed butterfly in the world. Upper forewings brown, red and black with white spots; upper hind wings orange and brown, with blue and black spots. Caterpillars are spiny, brown or black with pale stripe on each side.

Ant lion—*Brachynemurus abdominalis* (Brachynemurus=short thread tail; abdominalis=of the abdomen). The round-bodied, hairy larvae with big piercing jaws digs a sand trap for unwary insects and lies in wait at the bottom of the trap. The adult is a frail lacy-winged insect, somewhat resembling a dragonfly.

The other insects mentioned occur in many genera and species, no one of which is singled out for attention in this list.

## OTHER ARTHROPODS

Scorpion—*Vejois boreus* (Vejois=Etruscan god of the underworld; boreus=northern). A brown, flattened arthropod with 5 pairs of legs, the first pair forming pincers. The tail is carried over the body and ends in a powerful stinger.



Sun spider—*Eremobates sulphurea* (*Eremobates*=a solitary walker; *sulphurea*=yellowish). A hairy 10-legged spider-like animal with 2 pairs of pincers forming a snout.

Black widow spider—*Latrodectus curacaviensis* (*Latrodectus*=a robber and biter; *curacaviensis*=of Curacao; this species ranges to the West Indies). A black, poisonous spider. The female has a red mark, often resembling an hour glass, on the underside of the abdomen. The male is small.

## FISH

Mountain whitefish—*Prosopium williamsoni* (*Prosopium*=a mask, from bony structure of snout; *williamsoni*=the name of an early explorer, William-son). A small-mouthed, large-scaled, silvery fish of mountain streams and lakes. Locally often called "grayling."

Lake whitefish—*Coregonus clupeaformis* (*Coregonus*=a Latin name for whitefish; *clupeaformis*=her-ring-shaped). A large deep-bodied whitefish caught commercially in many lakes in the province, e.g. Pigeon, Wabamun, Lesser Slave.

Cisco—*Coregonus* spp. A small slender type of whitefish. Lower jaw projects further than upper.

Inconnu—*Stenodus leucichthys* (*Stenodus*=narrow tooth; *leucichthys*=white fish). A large whitefish with a long, flat head and projecting lower jaw. Mouth large, teeth weak or absent.

Arctic grayling—*Thymallus arcticus* (*Thymallus*=smelling like thyme; *arcticus*=of the Arctic). Distinguished by large purplish dorsal fin. Otherwise, whitefish-like, with slender, greenish-silver body.

Lake trout—*Salvelinus namaycush* (*Salvelinus*=a Latin name for fish of this type; *namaycush*=an Indian name for the fish). A big-bodied, green fish with lighter spots. Snout pointed and tail forked.

Brook trout—*Salvelinus fontinalis* (*fontinalis*=a little fountain or brook). A dark green fish bearing red spots ringed with blue on the sides, and light yellow-green irregular spots on the back. Also called the speckled trout or the squaretail.

Dolly Varden trout—*Salvelinus Malma* (*maima*=a name for the fish in Kamchatka). Red lateral spots distinguish this big-headed, greenish trout.

Cutthroat trout—*Salmo clarki* (*Salmo*=fish related to Atlantic salmon; *clarki*=Clark, of the Lewis and Clark expedition). The name comes from the slashes of red colour in folds beneath the gill covers. Silvery, with red often along the lower parts of the sides. Finely black-spotted.

Rainbow trout—*Salmo gairdneri* (*gairdneri*=Gairdner, an H.B.C. naturalist). Scales and black spots somewhat coarser than those of the cutthroat trout. Red streak along side.

Brown trout—*Salmo trutta* (*trutta*=a trout). Body colour ranges from brown to silver, but red and black spots on sides are distinguishing marks.

White sucker—*Catostomus commersoni* (*Catostomus*=mouth below; *commersoni*=Commerson, a French naturalist). A big-scaled, blunt-headed sucker.

Longnose sucker—*Catostomus catostomus*. A fine-scaled, long-headed sucker.

Minnows—this term technically belongs to several genera of fish in the carp family. Minnows are common in most waters, forming an important part of the food chain.

Northern pike—*Esox lucius* (*Esox*=a kind of pike; *lucius*=a Latin name for the pike). Known by its dishd snout and fierce array of teeth. Green with light spots. Body laterally compressed. Dorsal and anal fins well back.

Yellow perch—*Perca flavescens* (*Perca*=dusky; *flavescens*=yellowish). Very common small fish having a golden-green body with dusky spots and orange paired fins. Very spiny.

Walleye—*Stizostedion vitreum* (*Stizostedion*=punctured throat; *vitreum*=glassy, from the appearance of the eye). Eye has peculiar glazed appearance. Colour greenish. Two long dorsal fins.

Sculpins—*Cottus* spp. (*Cottus*=a Latin name for sculpins). Big-finned broad-headed small fish, usually brownish and mottled.

## AMPHIBIANS

Leopard frog—*Rana pipiens* (*Rana*=Latin for frog; *pipiens*=piping, referring to its song). A common black-spotted green frog of North America which stays near permanent bodies of water.

Wood frog—*Rana sylvatica* (*sylvatica*=of the woods). A light brown frog with a mask across the eyes. Abundant.

Spotted frog—*Rana pretiosa* (*pretiosa*=of great value). A western species of mountains and foothills; dark brown, with rough skin, usually spotted; can be recognized by the light streak on the edge of the upper jaw.

Chorus frog—*Pseudacris nigrita* (*Pseudacris*=false cricket frog; *nigrita*=something small and black). A small, dark frog, usually with two dorsal stripes.

Woodhouse's toad—*Bufo woodhousei* (*Bufo*=Latin for toad; *woodhousei*=for a person named Woodhouse). This toad has a boss or low crest on the snout and between the eyes. Common in the eastern half of the province.

Great Plains toad—*Bufo cognatus* (*cognatus*=related to, referring to other toads). Has large dark blotches, outlined with a lighter border. Widely distributed across the North American plains, but restricted to the southeast corner of Alberta.

Western toad—*Bufo boreas* (*boreas*=of the north). A very warty toad, dark green-grey in colour. Found chiefly in the mountains and foothills but does extend into aspen parkland.

Plains spadefoot toad—*Scaphiopus bombifrons* (Scaphiopus=spade foot; bombifrons=with a raised place on the forehead). Spadefoots have a hard, black tubercle on the underside of the hind foot, which is used for rapid burrowing into the ground.

Tiger salamander—*Ambystoma tigrinum* (Ambystoma=round-mouthed; tigrinum=tiger). Has yellowish-brown spots on green-black background. Common in farm ponds; often noticed in the fall of the year when some migrate into earthen cellars to hibernate.

Long-toed salamander—*Ambystoma macrodactylum* (macrodactylum=big toed). A salamander of the mountains, brownish-black in colour, with a dorsal, broken stripe of greenish yellow. Terrestrial.

## REPTILES

Garter snake—*Thamnophis* spp. (Thamnophis=brush snake). Three species occur in Alberta. All are dark brown with two or three lighter stripes running the length of the body. The mid-dorsal stripe of the plains garter snake is often orange. Those snakes are harmless but might emit an unpleasant discharge from cloacal glands when handled. Live on frogs, earthworms and insects.

Western rattlesnake—*Crotalus viridis* (Crotalus=a rattle; viridis=green). A greenish-brown snake, with dorsal brown spots and a horny rattle on the tail. Injects poison into its prey through hollow fangs which spring erect when mouth is widely opened.

Gopher (bull) snake—*Pituophis catenifer* (Pituophis=pine snake; catenifer=chain bearing). A mottled brown snake that can grow quite large. A very effective rodent-destroyer and hence valuable.

Hognosed snake—*Heterodon nasicus* (Heterodon=variety of teeth; nasicus=snouted). A toad-eating brown snake with a turned-up nose, useful in burrowing. Although harmless, this snake puts on a very threatening performance, hissing, feinting and spreading. When this fails, it rolls over and plays dead, rolling over again if it is righted.

Short-horned lizard (horned toad)—*Phrynosoma douglassi* (Phrynosoma=toad body, douglassi=from a surname). A small green-grey, insect-eating, spiny lizard with a short tail.

## BIRDS

Common loon—*Gavia immer* (Gavia=Latin name for the loon; immer=to immerse or dive). A large, black-headed diving bird with a black and white necklace and black and white body. Noted for their weird cry.

Canada goose—*Branta canadensis* (Branta=a brown goose; canadensis=of Canada). Brown body, black head and neck with white cheeks. This bird is our common "honker". May weigh over 15 lbs.

Mallard—*Anas platyrhynchos* (Anas=a duck; platyrhynchos=flat billed). The male is the "green-head". Both sexes have a blue-purple patch called a "speculum" on the secondary feathers on the wings, and orange legs. Fall migrating flocks may seriously deplete grain in fields. Some individuals may overwinter in Alberta in open water, e.g. near powerhouses.

Black duck—*Anas rubripes* (rubripes=red footed). Looks much like a dark female mallard. Rare in Alberta.

Gadwall—*Anas strepera* (strepera=noisy). Distinguished from a mallard by having yellow legs and a white and black speculum.

Pintail—*Anas acuta* (acuta=pointed). A slender long-necked duck with a pointed tail.

Green-winged teal—*Anas carolinensis* (carolinensis=of Carolina). A small duck with white underparts. Green speculum.

Blue-winged teal—*Anas discors* (discors=different). A small duck with a prominent blue shoulder patch.

Baldpate (American widgeon) — *Mareca americana* (Mareca=the widgeon; americana=American). Males white-crowned. Wing has a white patch in front of a black speculum.

Shoveler—*Spatula clypeata* (Spatula=a little shovel; clypeata=refers to the bill). A spoonbilled duck with blue shoulders.

Redhead—*Aythya americana* (Aythya=a sea bird). Head and neck chestnut or reddish-brown, back appears grey and underparts light in colour. Forehead high.

Canvasback—*Aythya valisneria* (valisneria=Valisneri, an Italian botanist of the 18th century; *Valisneria* is eel grass, a prominent item of diet of canvasbacks in some areas). A brown-headed and light-grey-bodied diving duck, distinguishable from the redhead by its sloping forehead.

Lesser scaup—*Aythya affinis* (affinis=similar). Female has brown head and neck, male iridescent black. Greyish back and white speculum. Bluish beak.

Common goldeneye — *Bucephala clangula* (Bucephala=head like a bull; clangula=noisy). Found in wooded plains areas. Distinct golden eye in black (male) or brown (female) head.

Barrow's goldeneye—*Bucephala islandica* (islandica=of Iceland). A goldeneye of the mountains. Purplish sheen to head, white cheek patch often crescent-shaped.

Bufflehead — *Bucephala albeola* (albeola=white spotted). A small duck with a large head, distinctively marked in male by white patch across top of head. Female has white cheek patch. Shows a lot of white on the wing in flight.



Harlequin—*Histrionicus histrionicus* (*Histrionicus*==an actor in theatre finery). Female drab but male gorgeous in blue, black, chestnut and white. Note particularly white stripes with black margins on head, neck and breast.

Swainson's hawk—*Buteo swainsoni* (*Buteo*=a hawk; *swainsoni*=a naturalist, Swainson). A fairly large hawk, dark on the back and light beneath. Legs unfeathered.

Golden eagle—*Aquila chrysaetos* (*Aquila* = an eagle; *chrysaetos*=golden). Dark brown in colour except for golden brown on back of neck. Legs feathered to base of toes. Large. Should not be needlessly persecuted for it is a useful predator, killing chiefly rodents. Now very scarce.

Bald eagle—*Haliaeetus leucocephalus* (*Haliaeetus*=a sea eagle, dweller by the sea; *leucocephalus*=white head). Best identified by its large size, white head and white tail. Again, this is a useful bird, which should be preserved.

Marsh hawk—*Circus cyaneus* (*Circus*=circling flight; *cyaneus*=bluish). Its most conspicuous feature is a prominent white rump patch.

Osprey—*Pandion haliaetus* (*Pandion*=a King of Athens; *haliaetus*=a sea eagle). This "fish hawk" is chiefly black and white in colour. Seen from below, white is the predominant colour. Watch for it cruising above lakes and diving in to catch fish.

Prairie falcon—*Falco mexicanus* (*Falco*=falcon; *mexicanus*=Mexican). A brown falcon with white underparts. Nests in clay banks along rivers.

Peregrine falcon—*Falco peregrinus* (*peregrinus*=foreign). Almost black in colour above; heavy black moustache mark. This is the hunting falcon of olden times.

Pigeon hawk—*Falco columbarius* (*columbarius*=interested in pigeons). A small dull hawk with long wings. Becomes very excited when its nest is approached.

Sparrow hawk—*Falco sparverius* (*sparverius*=pertaining to a sparrow). A pretty little white, brown and blue hawk commonly seen on fences and telephone lines throughout Alberta. It lives primarily on insects.

Sharp-tailed grouse—*Pedioecetes phasianellus* (*Pedioecetes*=plains dweller; *phasianellus*=little pheasant). A large brownish grouse having a pointed tail with white sides. Has V-marks on the breast. Burrows into the snow during winter.

Blue grouse—*Dendragapus obscurus* (*Dendragapus*=tree dweller; *obscurus*=obscure). A large mountain grouse, greyish-brown in colour, with a dark tail.

Spruce grouse—*Canachites canadensis* (*Canachites*=noise maker). The "fool hen", a small grouse found in thick conifer forest stands. Dark in colour. Very tame.

Sage grouse—*Centrocercus urophasianus* (*Centrocercus*=middle of the tail; *urophasianus*=pheasant tail). A very large grouse restricted to sage brush areas. Abdomen black. Tail has long pointed feathers.

White-tailed ptarmigan—*Lagopus leucurus* (*Lagopus*=hare foot; *leucurus*=white tail). A high mountain grouse with feathered legs and feet. Mottled brown and white in summer; completely white in winter.

Ring-necked pheasant—*Phasianus colchicus* (*Phasianus*=a pheasant; *colchicus*=of Colchis in Asia Minor). A large, brown, long-tailed game bird. The male is much larger and more gaily coloured than the female.

Hungarian (grey) partridge—*Perdix perdix* (*Perdix*=partridge). A small brownish partridge with light face and throat; tail feathers chestnut. Takes off from the ground with fast, straight, noisy flight.

Whooping crane—*Grus americana* (*Grus*=a crane). This bird stands four feet tall. In flight it is distinguished by black wing tips on white body. Its long neck stretches out in front and long black legs stretch out behind. Has a patch of red skin on head.

Coot—*Fulica americana* (*Fulica*=Latin name for a coot). Upper parts mostly black. Bill white, extending into forehead. These "mudhens" are common on sloughs. They fly only reluctantly, preferring to dive or run across the water to avoid danger.

Killdeer—*Charadrius vociferus* (*Charadrius*=a cleft-dweller; *vociferus*=a voice bearer). A black forehead band and one encircling the neck identify this bird. Its name comes from its repetitive call which is very distinctive. The killdeer builds a simple nest on the open ground, but its eggs and young are very hard to find because they blend so well into the background.

Willet—*Catoptrophorus semipalmatus* (*Catoptrophorus* = a mirror-bearer; *semipalmatus* = partially webbed (feet)). A large grey sandpiper, with prominent white bands on wings when in flight. Found around sloughs and lakes in southern Alberta.

American avocet—*Recurvirostra americana* (*Recurvirostra*=recurved (upturned) bill). The long upturned bill is distinctive. Body black and white; head and neck reddish; legs pale blue. Found near water.

Wilson's phalarope—*Steganopus tricolor* (*Steganopus*=covered or waterproofed foot; *tricolor*=three colours). Pale brown above and white beneath. Distinctive manner of swimming on water; moves in tight circles with head ducking and bobbing.

Great horned owl—*Bubo virginianus* (*Bubo*=the Latin name for this bird; *virginianus*=of Virginia). The only very large owl with prominent ear tufts.



Flicker—*Colaptes* spp. (*Colaptes*=a hammerer). Both yellow-shafted and red-shafted flickers are common in Alberta; the former more on the plains and the red more in mountains and foothills, but a broad zone of overlap occurs. Both are brownish with black bars. Names come from colours of wing lining and undertail. Male yellow-shafted flickers have a black moustache; male red-shafteds have a red moustache.

Dusty flycatcher—*Empidonax oberholseri* (*Empidonax*=a midge king; *oberholseri*=Oberholser, a person's surname). Grey above and light beneath. Two light bars on wings. Nests in deciduous trees in the mountains.

Canada Jay—*Perisoreus canadensis* (*Perisoreus*=one that heaps things up all around). The "camp-rober", a robin-sized grey bird with lighter forehead and darker nape. Common about camps in the boreal region and mountains, where he begs or steals food.

Common raven—*Corvus corax* (*Corvus*=Latin for raven or crow; *corax*=Greek for raven or crow). Larger than a crow, but otherwise similar. Flies rather more leisurely.

Crow—*Corvus brachyrhynchos* (*brachyrhynchos*=short-billed). Distinguished from the raven by its smaller size and loud "caw."

Clarke's nutcracker—*Nucifraga columbiana* (*Nucifraga*=nutcracker; *columbiana*=of Columbia, i.e. western America). A grey bird with black wings.

Black-capped chickadee—*Parus atricapillus* (*Parus*=a small bird, referring especially to titmice, in which family chickadees are found; *atricapillus*=little black cap). A little grey bird, with white cheeks separating its black crown and throat. Stays around all year. Their common name comes from their cheery call.

Dipper—*Cinclus mexicanus* (*Cinclus*=the Greek name for this bird). When seen at a distance it appears a dull greyish blue. Distinguished by its habit of hopping in and out of swiftly running streams and by its low flight up and down streams when disturbed.

Robin—*Turdus migratorius* (*Turdus*=a thrush; *migratorius*=migrating). One of our commonest and most enjoyed birds.

Cedar waxwing—*Bombycilla cedrorum* (*Bombycilla*=silky tail; *cedrorum*=of the cedars). Generally cinnamon-grey in colour, with a black mask and a crest on the head; a cluster of red, waxy feathers on each wing. Seen in summer, whereas the larger Bohemian waxwing appears during fall and winter.

Starling—*Sturnus vulgaris* (*Sturnus*=a starling; *vulgaris*=common). A black bird with a short tail. Commonly in flocks. A close look shows the body to have a purplish tinge and small brown spots. First recorded in Alberta in 1934, now it has covered most of the province.

House (English) sparrow—*Passer domesticus* (*Passer*=Latin for a sparrow; *domesticus*=domestic, that which is found around the house). Another introduced species, the house sparrow is common throughout the province. Greyish-brown in colour and very noisy.

Bobolink—*Dolichonyx orizivorus* (*Dolichonyx*=long-clawed; *orizivorus*=rice-eater). This bird is just becoming established on the prairies of Alberta. Males are conspicuous in flight in black and white and yellow; they have a delightful song. The females are plainer, generally of a buffy colour.

Western meadowlark—*Sturnella neglecta* (*Sturnella*=little starling; *neglecta*=neglected, unnoticed). This is the songster of the prairies, with its yellow breast and black necklace. In flight it is a dusty brown, with white margins to the tail.

Brewer's blackbird—*Euphagus cyanocephalus* (*Euphagus*=a good eater; *cyanocephalus*=blue head). A glossy black bird whose head has a purplish tinge. The common prairie blackbird.

Audubon's warbler—*Dendroica auduboni* (*Dendroica*=tree dweller; *auduboni*=J. J. Audubon (1785-1851), celebrated American ornithologist). Has yellow patches on crown, rump, throat and sides. Nests in evergreens.

American goldfinch—*Spinus tristis* (*Spinus*=a linnet or some such bird; *tristis*=sad). A small, lemon-yellow or greenish bird with black cap, wings and tail. The goldfinch can be identified by its undulating flight, rising as it beats its wings, sinking as it glides. A cheery singer.

Lark bunting—*Calamospiza melanocorys* (*Calamospiza*=a reed finch; *melanocorys*=black-helmeted). A black bird with a large white wing patch. Tail feathers have small white tips.

Oregon junco—*Junco oreganus* (*Junco*=made of rushes, perhaps referring to nests of grass; *oreganus*=of Oregon). Chiefly a mountain form. Has a brownish back and lighter sides. Often seen around camps and cabins.

White-crowned sparrow—*Zonotrichia leucophrys* (*Zonotrichia*=band of hairs (feathers); *leucophrys*=white eyebrow). A common summer resident of the mountains, with black and white stripes on the head and a relatively long tail.

## MAMMALS

Man—*Homo sapiens* (*Homo*=Latin for man; *sapiens*=having wisdom). The most ubiquitous species of animal, colonizing all quarters of the globe and living under all sorts of environmental conditions, largely because he can insulate himself from his environment to a certain extent. Occurs in several races or varieties, which cannot be clearly defined.

Hoary marmot—*Marmota caligata* (*Marmota*=marmot, from Latin mountain mouse; *caligata*=with boots). A mountain rodent reaching 15 lbs. or more in weight. Grizzled appearance. Often suns on exposed rocks. Shrill, piercing whistle is alarm call.

Ground squirrels—*Citellus* spp. (*Citellus*=Latin for a ground squirrel). The several species of these are described in detail in the text (*lateralis*=of the sides; *tridecemlineatus*=13-lined; *spilosoma*=spotted body; the others are named after men or places).

Chipmunk—*Eutamias* spp. (*Eutamias*=a true storer). Small, active rodents with 5 dark and 4 light stripes on the back. Den in burrows.

Red squirrel—*Tamiasciurus hudsonicus* (*Tamiasciurus*=storing squirrel; *hudsonicus*=of the Hudsonian (northern) region). Distinguished by red colour and long bushy tail. Keeps chiefly to the trees. Very curious, with a habit of "scolding" intruders.

Flying squirrel—*Glaucomyss sabrinus* (*Glaucomyss*=silvery mouse; *sabrinus*=a river nymph). This nocturnal rodent is easily recognized by the loose fold of skin from fore to hind limb which can be stretched tautly for gliding; also has large, lustrous eyes, dense, silky fur and a long flat furry tail.

Northern pocket gopher—*Thomomys talpoides* (*Thomomys*=mound mouse, referring to the mounds made by their burrows; *talpoides*=mole-like). This is the animal Albertans call a "mole". Well-developed forefeet and claws for digging. Stubby head and short body; tail nearly hairless, and apparently very sensitive for backing in burrows.

Beaver—*Castor canadensis* (*Castor*=Greek for beaver). A water-dwelling, brown animal with a flat, scaly tail. The largest North American rodent. Builds elaborate dams and lodges from wood it cuts and gathers.

Kangaroo rat — *Dipodomys ordii* (*Dipodomys*=two-footed mouse; *ordii*=Ord, the name of a biologist). Occurs rarely in southeastern Alberta. Has long hind legs for jumping and a long tail with a tuft at the tip.

White-footed mouse—*Peromyscus maniculatus* (*Peromyscus*=little pouched mouse; *maniculatus*=little hands). One of the most abundant and widely dispersed of our small mammals. Grey to cinnamon colour above, white beneath. Active all year round.

Red-backed vole—*Clethrionomys gapperi* (*Clethrionomys*=a door-barring mouse; *gapperi*=Dr. Anthony Gapper, a 19th century collector in Ontario). A red-backed chunky mouse-like rodent with longish fur. Tends to be restricted to forested regions. Usually very abundant where it occurs.

Meadow vole—*Microtus* spp. (*Microtus*=small-eared). Several species of *Microtus* are found in Alberta. Generally they are brownish, stubby mouse-like creatures with tails shorter than those of mice. Make complicated trails and runways through grass and bushes. Wheat, left overwinter in stocks, is subject to heavy loss from these rodents. Weasels, coyotes and hawks are the best controls for most rodents.

Muskrat—*Ondatra zibethicus* (*Ondatra*=an Indian name for the muskrat; *zibethicus*=musky-smelling). This large rodent has toes of the hind feet fringed with bristles to aid in swimming and a long, scaly tail, which is flattened from side to side. Generally a dark brown colour, with thick, soft fur. Lives in bank burrows or lodges built of cattails and bulrushes in ponds and sloughs.

Porcupine—*Erethizon dorsatum* (*Erethizon*=to provoke or excite; *dorsatum*=on the back). Easily recognized by the presence of a frightening armature of quills on the back and tail, which are erected in the direction of danger when the animal is provoked. The tail is swung swiftly from side to side; the quills there are relatively loose and readily stick into any unwary animal unfortunate enough to be slapped. The quills cannot be thrown or shot out. Chief enemies other than man, are fishers and wolverines.

Coyote—*Canis latrans* (*Canis*=dog; *latrans*=a barker). A ubiquitous and clever predator, apparently able to thrive in the presence of man, despite man's efforts to eradicate him. A medium-sized dog with reddish grey fur, a bushy tail and a pointed nose.

Red Fox—*Vulpes fulva* (*Vulpes*=a fox; also cunning; *fulva*=reddish yellow). A slim, graceful animal, with pointed muzzle, large, erect ears and a bushy tail. Has four colour phases: red, black, cross and silver.

Cougar (mountain lion; puma)—*Felis concolor* (*Felis*=Latin for cat; *concolor*=all the same colour). Largely restricted to the mountains and foothills in Alberta, this solitary predator is mercilessly hunted by man, having a reputation far worse in fancy than in fact.

Lynx—*Lynx canadensis* (*Lynx*=The Greek name for this cat). A long-legged, round-headed animal with big feet and tufted ears. May weight 30 lbs. or more. Bigger than a bobcat (*Lynx rufus*) which does not have a tail ringed with black or ears so prominently tufted.

Black bear—*Ursus americanus* (*Ursus*=a bear; *americanus*=american). The common bear of Alberta. Found in a variety of colours, from almost white, through brown, to black.

Grizzly bear—*Ursus horribilis* (*horribilis*=horrible). A massive grizzled animal with a concave profile and long claws. Now restricted to the mountains and boreal forest.



Weasel—*Mustela* spp. (*Mustela*=a weasel). Weasels can be distinguished as least, short-tailed, (ermine) or long-tailed, each as a separate species. Common small predators, sinuous and long of body. Usually prey on small rodents.

Badger—*Taxidea taxus* (*Taxidea*=similar to a badger; *taxus*=a badger). A short-legged, flat-bodied burrowing relative of the weasel. Has black paws and a white stripe running back over the middle of the head.

Wolverine—*Gulo luscus* (*Gulo*=a glutton; *luscus*=? one-eyed). A rarely-seen thick-set animal of the weasel family. Legs black, body dark brown with lighter stripes on upper side. Probably feeds chiefly on rodents but will defile food and destroy things wantonly.

Skunk—*Mephitis mephitis* (*Mephitis*=a bad odour). The striped skunk ranges through Alberta. In its defense, the skunk can eject a foul-smelling glandular secretion up to a distance of 10 feet. Primarily insectivorous.

Marten—*Martes americana* (*Martes*=marten in Latin). A dense-furred weasel-like animal living in forested areas. Extremely agile in trees.

Fisher—*Martes pennanti* (*pennanti*=Pennant, an 18th century British zoologist). A heavy-bodied, member of the weasel family, which is often found in trees. May reach 40 inches from head to tail. Very dark brown, with white-tipped hairs that give it a silvery look.

Jackrabbit (prairie hare)—*Lepus townsendi* (*Lepus*=a hare; *townsendi*=honours the name of Townsend, an American scientist). Our largest hare averaging about 7 lb. with long ears and a big tail. Can travel at high speed (30 m.p.h.) in 12-15 foot bounds. Prefers open or brushy prairie.

Snowshoe (varying) hare—*Lepus americanus*. Prefers wooded country. Smaller than the jackrabbit. Population number varies greatly during a 10-year cycle. Greyish-brown in summer, white in winter. Feet heavily furred in winter.

Cottontail rabbit—*Sylvilagus nuttalli* (*Sylvilagus*=hare; *nuttalli*=Nuttall, a 19th century biologist). A greyish rabbit, smaller, shorter-eared and somewhat more retiring than our other rabbits and hares. Does not change colour in winter. Burrows.

Pika—*Ochotona princeps* (*Ochotona*=Mongol name for the pika; *princeps*=chief). Short-legged, short-eared, chunky "rock rabbits" inhabiting talus slopes in the mountains. Shy and alert, they are hard to spot. Collect and cure hay for winter food.

Mule deer—*Odocoileus hemionus* (*Odocoileus*=hol-low tooth; *hemionus*=Greek for a mule). A large deer with long ears and a black-tipped tail. Antler tines upswept into V's. Has a distinctive stiff-legged bounding gait when moving rapidly. Alberta's most abundant big game mammal. As with all deer, the antlers are shed in early winter and regrow during the following spring and summer.

White-tailed deer—*Odocoileus virginianus* (*virginianus*=of Virginia). Erects its white tail as a "flag" when running away. Antlers have undivided tines rising from a main beam. Does not bound as does the mule deer.

Elk (wapiti)—*Cervus canadensis* (*Cervus*=Latin for deer). A large reddish-brown deer with a pale yellow rump patch. The male has large, spreading antlers and a darker brown shaggy neck.

Moose—*Alces americana* (*Alces*=elk). The largest of the deer family. Great, palmate antlers, swollen muzzle, "bell" of skin and hair hanging from throat, shoulders much higher than rump. A relatively shy, retiring animal. Often seen shoulder-deep in lakes, grazing on aquatic vegetation.

Caribou—*Rangifer* spp. (*Rangifer*=reindeer, to which caribou are closely related). This member of the deer family is best recognized by its antlers which have prominent brow tines, or branches down over the nose. White-rumped. Barren ground caribou are lighter in colour and slightly smaller than woodland caribou.

Pronghorn antelope—*Antilocapra americana* (*Antilocapra*=antelope goat). A species of the open plains, keen-eyed, fast and protectively coloured; reddish brown above and white beneath; prominent white rump. Black horns are shed annually. Occurs in limited numbers on a restricted range, so the pronghorn is rigorously protected.

Bighorn sheep—*Ovis canadensis* (*Ovis*=sheep, in Latin). Best identified by massive, curling brown horns, best developed in male. Short-haired and greyish brown, with light rump patch. Skilled mountain climbers.

Mountain goat—*Oreamnos americanus* (*Oreamnos*=mountain lamb). Long shaggy, white hair, short black horns in both sexes, shoulders higher than rump. A retiring animal, generally keeping to relatively inaccessible regions in the high Rockies.

Cattle—*Bos taurus* (*Bos*=Latin for ox; *taurus*=Latin for bull or ox). A domestic animal of which many varieties have been developed, e.g., Hereford, Holstein, Guernsey, etc.

Bison (buffalo)—*Bison bison* (*Bison*=Greek for a wild ox). A large hoofed mammal of the cow family. Once numerous on the central plains of North America, it is now restricted to reserves. The northern wood buffalo differs somewhat from the southern plains buffalo.

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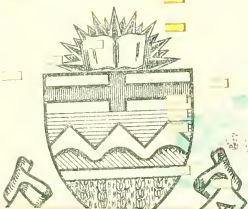
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